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AURAL AND READING COMPREHENSION OF SPATIAL  
PREPOSITIONS IN GRADES TWO, THREE AND FOUR

by



Gloria Mannall-Fretwell

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS  
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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES  
AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Aural and Reading Comprehension of Spatial Prepositions by Children in Grades Two, Three and Four submitted by Gloria Mannall-Fretwell in partial fulfilment of the requirements for the degree of Master of Education.

Date.....September, 1971.....





MacGinitie Reading Tests. All tests were administered and scored by the investigator.

Statistical measures included: one way analysis of variance, two way analysis of variance, computation of correlation coefficients and t-tests.

It was found that listening understanding of spatial prepositions was superior to reading understanding for all grades tested.

Grade four children showed greater listening and reading understanding of spatial prepositions than grades two and three children.

Although there was no main effect due to sex on the tests of listening and reading understanding of spatial prepositions there was a significant interaction between grade and sex on the paraphrasing test. Boys performed higher than the grade two girls, whereas girls' scores were higher for grade three and four.

Intelligence scores appeared to be the best predictor of performance on the Spatial Prepositions Paraphrasing Test. Reading ability (vocabulary and comprehension) was significantly related to reading understanding of spatial prepositions for grade two only. The only significant correlation between listening understanding of spatial prepositions and the dependent variables was found for language I.Q. for grade two.

A descriptive analysis showed that grade four children tended to give more acceptable responses than pupils at the



other grade levels. Their responses also tended to show greater preciseness in meaning which may indicate a more refined stage in the use of the verbal labels representing the spatial prepositional concepts. Results also showed that some prepositions may be disappearing from common usage among children.

A need for more research, concerning the reading understanding of spatial prepositions, particularly within passage context, and preparation of pupils for the spatial concepts which they will encounter in print, was indicated.

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2	2. The second step is to do background research.	
3	3. The third step is to form a hypothesis.	
4	4. The fourth step is to test the hypothesis by conducting an experiment.	
5	5. The fifth step is to analyze the data and draw a conclusion.	
6	6. The sixth step is to communicate the results of the experiment.	
7	7. The seventh step is to repeat the experiment to verify the results.	
8	8. The eighth step is to publish the results of the experiment.	
9	9. The ninth step is to have other scientists replicate the experiment.	
10	10. The tenth step is to use the results of the experiment to make a new hypothesis.	
11	11. The eleventh step is to test the new hypothesis.	
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22	22. The twenty-second step is to publish the results of the experiment.	
23	23. The twenty-third step is to have other scientists replicate the experiment.	
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## CHAPTER I

Comprehension is based on concepts. Through the use of concepts the child in early stages brings meanings to symbols rather than getting meanings from symbols. Concepts of young children need development, enrichment and clarification. (Nila Banton Smith)

### INTRODUCTION

The nature of the reading process is complex in that it involves not only the recognition of sound/symbol correspondence and the decoding of the symbolic representation of thought, but it also necessitates the acquisition of the intent of the writer through transfer of thought. When this transfer of thought from writer to reader takes place, comprehension, in the form of translation, is said to have occurred.

The ability to read with comprehension depends upon many factors, some of which are contained within the language of print itself. Amongst the features contained within the language of print which have been considered to be of significance to the comprehension of reading, are those involving the understanding of language concepts, and the identification of structures used to embody thought processes. It has been found that author style (Ratekin, 1965), sentence structure (Strickland, 1962; Fagan, 1969), embeddedness of ideas (Robertson, 1966), and vocabulary



Introduction

The purpose of this study is to investigate the effects of the proposed changes on the environment. The study will be conducted in a systematic and thorough manner, taking into account all relevant factors. The results of the study will be presented in a clear and concise manner, allowing for a comprehensive understanding of the issues at hand. The study will be conducted in a manner that is both efficient and effective, ensuring that all necessary data is collected and analyzed. The study will be conducted in a manner that is both efficient and effective, ensuring that all necessary data is collected and analyzed.

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meanings (McCracken, 1966), can all have an adverse effect upon the inexperienced, or inept, reader's ability to interpret the author's intended message.

Other factors which can determine the degree of comprehension obtained by the reader are those which are dependent upon the reader himself. Research has shown that intelligence (Monroe, 1932), maturation (Olson, 1940) conceptual development (Birks and Bruce, 1955), experience (Cantor, 1935), and mastery of language (Hughes, 1953) can all influence the amount and quality of reading understanding experienced by the reader.

Most basal reading texts attempt to eliminate some of the difficulties experienced by the primary grade children by limiting concept presentation through use of controlled vocabularies. Some concepts, however, although of an abstract nature, are required to give supportive meaning to other more concrete concepts. For example, in the following sentence, "Samuel fell between the bales of hay", between supports the concepts of Samuel's falling, and the bales of hay, by denoting where he fell. Between also establishes the relationship of the two concepts.

Since prepositions of spatial position, of which between is an example, are one of the primary means whereby the concepts of distance and direction are established, their occurrence in both oral and written form is legion. For this reason their understanding is of importance to primary grade children who are being taught to read.





If, as Watts (1944) states, prepositions which denote position in space are learned as a result of maturation and experience, the assumption that all children are ready to meet spatial prepositions in print at the pre-primer level is unwarranted. That children are required to comprehend such words is evidence by perusal of reading texts currently in use in primary classrooms. Examination of Language texts as well as the teacher's guide to a number of basal reading texts reveals that the actual presentation of prepositions as concepts to be learned, does not take place before the grade six level. If, therefore, reading comprehension is dependent upon factors both within the printed page and within the reader, then reading comprehension of prepositions of spatial position (verbal understanding of which is dependent upon the context in which they are found and the conceptual development of the reader) may not occur by chance. It is possible that it may be necessary to teach the relationship which exists between the spatial concept and its symbolic printed representation. Since Johnson (1970) discovered that verbal understanding of spatial prepositions was developmental it may be necessary, as Smith (1963) suggests, to prepare children for the concepts which they are going to encounter in print.

Since a large proportion of the time that a child spends in school involves learning through listening and reading, research investigating the listening and reading understanding of spatial prepositions of children at the



grade two, three and four levels should help educators to decide whether preparation for meeting spatial concepts in print is necessary.

### THE PROBLEM

Most of the research concerned with children's understanding of concepts of spatial position has involved very young children. For this reason little is known about children's reading understanding of the prepositions which are used to describe the orientation and relationships, one with another, of people and objects in space.

Whilst understanding through listening and reading of spatial prepositions require the application of similar thought processes, the fact that decoding of printed symbols is also involved in reading suggests that reading spatial prepositions may require the application of more abstract cognitive processes. Indeed, although it can be shown that the whole communications process involves abstract reasoning, some concepts, because of their particular nature, require a greater degree of abstract reasoning to be brought to bear than do others. For example, the sentence, "The dog has a bone," requires a conceptualized abstraction of the event which occurred, however, the level of thought abstraction necessary is less than that required by the following sentence: "The dog sat beneath the chair, on the right of the door, with his bone between his paws." This sentence contains words which could be readily identified by a grade two

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child, however, the spatial concepts, beneath, on the right of, and, between, appear to require a greater abstraction of thought because the ability to comprehend the relationships between the 'concrete' objects involved requires the listener to project his thoughts beyond the immediate situation and to hold the related clauses sequentially in mind. Furthermore, although the comparison here is between a simple and a complex sentence, each clause in the latter is more complex in meaning than the former sentence. When a sentence containing a number of spatial prepositions is presented in written form to a child the task of understanding it seems likely to be even more difficult particularly if the child does not have an understanding of the individual spatial concepts involved.

If, as Smith(1963), says, it may be necessary to teach certain concepts before children meet them in print, the degree of listening understanding of those concepts must first be ascertained.

In this study an attempt will be made to investigate grade two, three and four children's ability to demonstrate their listening and reading understanding of twenty spatial prepositions.

## II. DEFINITION OF TERMS

For purposes of this study terms are defined as follows:

1. Terms of spatial position - prepositions which define the position of an object or the relationship of one

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part outlines the specific procedures for recording transactions, including the use of standardized forms and the requirement for double-checking entries to prevent errors.

3. The third part addresses the role of the accounting department in monitoring and reporting on the organization's financial health. It highlights the need for regular audits and the importance of providing timely and accurate financial statements to management and stakeholders.

4. The fourth part discusses the challenges faced by the organization in implementing these procedures, such as limited resources and the need for staff training. It suggests several strategies to overcome these challenges, including the use of technology and the implementation of incentive programs.

5. The fifth part provides a summary of the key points discussed in the document and reiterates the organization's commitment to maintaining high standards of financial integrity and transparency.



object to another. Terms used will be those included in the McLeod Prepositions Test. This test contains the following prepositions:

(a) on the right	(k) above
(b) beside	(l) across
(c) around	(m) on top of
(d) behind	(n) beneath
(e) in front of	(o) out
(f) on	(p) on the left
(g) over	(q) below
(h) between	(r) underneath
(i) through	(s) inside
(j) outside	(t) near

2. Listening understanding of spatial prepositions - Ability to understand prepositions of spatial position as indicated by scores on The Spatial Prepositions Listening Understanding Test (SPLUT).
3. Reading understanding of spatial prepositions - Ability to understand prepositions of spatial position as indicated by scores on the three reading prepositions tests: The Spatial Prepositions Paraphrase Test, (SPPT), The Spatial Prepositions Sentence Completion Test (SPSCT), and The Spatial Prepositions Story Completion Test (SPStCT).
4. Intelligence - The intelligence quotient as indicated by the scores on The California Short Form Test of Mental Maturity.





5. Reading vocabulary and reading comprehension ability - achievement scores on the Gates MacGinitie Reading Tests.

### III. THE HYPOTHESES

The following null hypotheses were formulated:

1. There is no significant difference between the scores on a test of listening understanding of spatial prepositions and scores on tests of reading understanding of those prepositions for each of:
  - a) grade two.
  - b) grade three.
  - c) grade four.
2. There is no significant difference between the scores of grades two, three and four on
  - a) their listening understanding of spatial prepositions and
  - b) their reading understanding of these prepositions.
3. There is no significant correlation between listening of spatial prepositions and
  - a) chronological age.
  - b) reading ability.
  - c) intelligence.
4. There is no significant correlation between reading understanding of spatial prepositions and
  - a) chronological age.
  - b) reading ability.

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RESEARCH REPORT

REPORT NO. 1000  
TITLE: THE EFFECT OF TEMPERATURE ON THE RATE OF  
REACTION OF HYDROGEN PEROXIDE WITH  
FERROUS SULFATE IN AQUEOUS SOLUTION  
AUTHOR: J. H. KILPATRICK, JR.  
DATE: JANUARY 1954

ABSTRACT: The rate of reaction of hydrogen peroxide with  
ferrous sulfate in aqueous solution has been studied  
as a function of temperature. The rate increases  
with increasing temperature.

INTRODUCTION: The reaction of hydrogen peroxide with  
ferrous sulfate in aqueous solution is a well-known  
reaction. It has been studied extensively in the  
past.

EXPERIMENTAL: The reaction was studied in aqueous  
solution at various temperatures. The rate was  
measured by the disappearance of ferrous sulfate.

RESULTS: The rate of reaction increases with  
increasing temperature. The activation energy  
of the reaction is 14.5 kcal/mole.

CONCLUSIONS: The rate of reaction of hydrogen  
peroxide with ferrous sulfate in aqueous solution  
increases with increasing temperature. The  
activation energy of the reaction is 14.5 kcal/mole.

- c) intelligence.
- 5. In an analysis of the scores of the test of listening understanding of spatial prepositions (SPPT).
  - a) there is no interaction between grade and sex
  - b) there is no main effect due to sex.
- 6. In an analysis of the scores of the test of reading understanding of spatial prepositions (SPPT).
  - a) there is no interaction between grade and sex
  - b) there is no main effect due to sex.

#### IV. ASSUMPTIONS

It is assumed that the Spatial Prepositions Tests of Listening and Reading Understanding are valid measures of the listening and reading understanding of spatial prepositions.

It is also assumed that randomization of the choice of subjects will not produce any considerable bias in scores on any test and that the sample is representative of the population from which it was drawn.

#### V. LIMITATIONS OF THE STUDY

Although it is accepted by the investigator that oral language facility and development is related to conceptual ability and development, and that the language variable is one which may have an effect upon a student's scores, this study will not be controlled for this factor because no instrument suitable for this purpose is at present available.

CONSTITUTIONAL HISTORY

The first part of the book deals with the early history of the constitution, from the time of the Magna Carta to the present day. It covers the development of the principle of the separation of powers, the growth of the executive and legislative branches, and the evolution of the judicial system. The author discusses the various constitutional crises that have occurred throughout the history of the United States, and the ways in which the constitution has been amended and interpreted.

The second part of the book is devoted to a detailed examination of the federal system. It explores the relationship between the federal government and the states, and the role of the federal government in the protection of individual liberties. The author also discusses the various powers and responsibilities of the federal government, and the ways in which these powers have been exercised over time.

The third part of the book is a critical analysis of the constitution. It examines the strengths and weaknesses of the constitutional system, and the ways in which the constitution has been used to protect and promote the interests of the people. The author also discusses the various proposals for constitutional reform, and the ways in which the constitution can be made more effective in the future.

## VI. SIGNIFICANCE OF THE STUDY

The need to identify factors both within the printed page and within the reader which prevent children from understanding the author's message is essential if:

- a) children are to be taught to read efficiently,
- b) prevention of reading disability is an educative priority, and
- c) if each student is to reach his potential in terms of literacy.

For this reason the investigator believes that should a discrepancy exist between a child's ability to demonstrate understanding of spatial relationships at the 'concrete' and abstract level, educators may see the need to establish for children, the relationship which exists between a concept and its printed, symbolic representation, particularly where the concept itself is abstract in nature.

## VII. OVERVIEW OF THE INVESTIGATION

This study involved the following:

1. The construction of materials for use in testing listening and reading understanding of spatial prepositions.

These materials included:

- a) the collection of models for manipulation
- b) a "cloze" sentence test, a story test, and a paraphrase test.

2. The administration of these tests and of standardized





tests of reading and intellectual ability to children aged from seven to ten years in grades two, three and four in St. Albert School District #6, to discover the spatial preposition listening and reading understanding of these children.

Chapter II provides a review of the research and literature which is pertinent to this study.

Chapter III describes the tests and research procedures and Chapter IV provides an account of the data which was subjected to statistical analysis.

In Chapter V a descriptive analysis of the investigator's findings concerning the Spatial Prepositions Sentence and Story Completion Tests is given, together with the criteria on which this description was based.

Chapter VI, the final chapter, contains the summary, conclusions and implications of this investigation.





## CHAPTER II

### THE BACKGROUND OF THE STUDY

In order to provide a background of information for this study, this chapter will contain a review of the literature and research studies that are relevant to the investigation of children's understanding of prepositions of spatial position.

The chapter will be organized in the following manner.

Section I will be concerned with the definition and function of prepositions in general and spatial prepositions in particular. Included in this section will be a brief review of the function and forms of prepositions in English literature, both historically and in the present day.

Section II will concentrate upon the importance of spatial prepositions in the communications process.

The third section of this chapter will be concerned with the variables within the reader upon which the understanding of spatial prepositions depends. Development of spatial concepts, the role of language in this development, the relationship of intelligence to the abstract reasoning involved in the understanding of spatial concepts, the effect of experience upon listening and reading understanding of spatial prepositions, in terms of cultural and educational environment, and the effect of sex on the listening and reading understanding of spatial concepts, will all be



discussed in this section. The fourth and last section will be concerned with some of the factors contained within print which could affect the understanding of spatial prepositions in the context of print.

## I. DEFINITION AND FUNCTION OF PREPOSITIONS

An interesting definition of prepositions was given by William Cobbett in 1833. In a Grammar of the English Language "intended for the use of schools and of young persons in general; but more especially for the use of soldiers, sailors, apprentices, and ploughboys, Cobbett states that words such as in, to, for, into, against and at are "called Prepositions, from two Latin words, meaning before and place; and this name is given then because they are in most cases placed before Nouns and Pronouns (p. 70)." He goes on to say that the chief use of prepositions is to express the different "relations or connexions which nouns have with each other, or, in which nouns stand with regard to each other (p. 70)." Although Cobbett states that "it is useless to go into curious inquiries as to the origin of prepositions (p. 70)," a brief review of the history of prepositions reveals how they have helped individuals to clarify position and distance since the days of the Saxons.

Many of the prepositions which are in common use today were recorded in the chronicles that go back to ancient times. The Old English (OE) prepositions were closely allied to the adverbs and most could be used as adverbs without any change



of form. Many of the OE prepositions were compounds made up of prepositions, especially *be*, and place adverbs ending in *an*, or *on*. *be* became 'b' before a vowel. Examples are *be - by*; *beforan - before*; *behindan - behind*; *beneo~~pan~~an - beneath*: and, *bufan - above*. The origins of the modern spatial prepositions can readily be seen.

In Middle English (ME) yet another of the spatial prepositions came into general use. That was: *innan - inside*. It was used as a preposition so as to avoid the ambiguity of the OE 'on' which meant: on, or in. Since this word 'innan' was generally unstressed it was shortened to 'ine' and then to 'in' (Sweet, 1892, pp. 204 - 207). An interesting comparison can be made with the trend today for using 'in' instead of 'inside'. Ben Johnson in 1640 said,

Prepositions are also a peculiar kind of Adverbs, and ought to be referred hither. Prepositions are seperable or inseperable. Seperable are for the most part of Time and Place as among, according, without, afore, after, before, behind, under, upon, beneath, over, against, besides, neere (p. 48).

Most grammarians were of the opinion that prepositions were unimportant words when treated individually without regard to context. In 1712, Mattaire said, "The preposition has (no signification) without the word which it precedes and to which it is in the nature of a sign (p. 93)."

Vorlat (1963) states that John Greenwood is the only grammarian to take the preposition for a very important part of speech. In 1711 Greenwood wrote of prepositions and conjunctions, as





the Nerves and Ligaments of all Discourse ... (man) must think in Train, and observe the Dependence of his Thoughts and Reasonings one upon another. And to express well such methodical and rational Thoughts, he must have Words to shew what Connexion, Restriction, Distinction, Opposition, Emphasis, and c. he gives to each respective Part of his Discourse (p. 70).

The modern grammarian Brook (1958) sees the significance of the preposition today as being the means whereby a wide variety of abstract relations are expressed. He writes

Another change in English syntax has been a tendency to move from the concrete to the abstract, a tendency well illustrated in the history of English prepositions, which originally ... indicated relationship of place (p. 145).

This point of view was held in 1871 by John Earle who spoke of prepositions thus,

They constitute a mental product of the most exquisite sort. They are more cognate to mind; they have caught more of the freedom which is the heritage of mind; they are more amenable to mental variations... than pronouns can possibly be (p. 440).

Although many of the ancient grammarians attempted to define the meanings of specific spatial prepositions they did not attempt to explain the concepts which the use of such prepositions reflects.

## II. IMPORTANCE OF SPATIAL PREPOSITIONS IN THE COMMUNICATIONS PROCESS

The importance of spatial prepositions is noted by Lanegran et al (1970). They state that the ability to verbalize and demonstrate distance and direction, which is manifested through the use of spatial prepositions, is a





necessary prerequisite to an individual's functioning in society. Understanding of these prepositions requires knowledge of personal orientation in space and knowledge of objects in space and their relationships one with another.

Shemyakin (1959) states that

...in order to localize objects in surrounding space, man has to differentiate between the objects which are in front of him and those which are to the right or left of him, behind, above, or below him as well as those in between (p. 188).

In presenting the view that space differentiations are one of the essential conditions for the perception of objects and phenomena of the external world and which are brought about by many sensations, Shemyakin (1959, p 189) quotes Ananyev (1954) as saying:

It must be taken into consideration in the process that the sensing human being himself is a material body occupying a definite place in space and possessing certain spatial characteristics (size, shape, a three dimensional body, directions of movements in space and so forth). The interaction of man and his environment includes the human body itself with the system of coordinates which is characteristic of it. This is particularly clear in spatial orientation (p. 130).

Certain spatial prepositions pose greater difficulty than others for denoting location because they vary according to the position of the speaker using them. Such prepositional phrases as 'on the left', 'to the left', 'by the right', 'on my right,' etc. often require the speaker, listener or reader to transpose himself, in mind at least, to adjust to the position of the objects concerned. The sentence "Take hold



of your partner's right hand" often causes difficulty to a child since it requires the child to orientate himself to the right side of another person. Thus he must in effect place his right orientation in reverse.

Shemyakin (1959) discusses this problem,

The verbal system of identification is expressed in such words as "up", "down", "forward", "backward", "right", and "left". Its concrete content is formed by a sensory system of reckoning: the word "up" indicates a direction opposite to that of the Earth's gravitational force.... However, it (the verbal system) differs from the sensory system of reckoning. The directions which "to me" are "right" and "front" directions, will be "left" and "right" directions to a man facing me (p. 215).

Kladnitskaya (1956) discovered that the dominance of the right or left hand in children develops more slowly than the practical differentiation of space directions. He also found that the connections between the names and the right-left directions develop more slowly than those between the names and the up-down and forward-backward directions. The role which experience plays in the development of such understandings is evidenced by the children who because of illness had delayed development in the ability to walk upright. These children found up-down directions more difficult than the right-left ones.

The importance of understanding the spatial relationships found in reading cannot be underestimated for it is in reading that fully developed internalized spatial concepts are most needed since all understanding depends upon abstract



thinking in the absence of proximate objects. The fact that all space directions are relative adds to the difficulties faced by the reader.

### III. FACTORS INFLUENCING THE UNDERSTANDING OF SPATIAL PREPOSITIONS

Although reading is dependent upon factors contained within the language of print, that which the reader brings to bear upon the reading situation, in terms of his cognitive and affective abilities determines the quality of the transaction which takes place between the reader and the author. Thus in order to investigate children's understandings of spatial terms it is necessary to consider those variables which are most likely to be involved both within the reader and the task itself.

According to Jenkinson (1970) research results "suggest that not only intelligence but appropriate levels of cognitive development including vocabulary and concept formation are prerequisite to comprehension (p. 184)."

Understanding of the written words which symbolize spatial position requires a) knowledge of spatial concepts and b) the ability to translate these concepts into an abstraction of spatial position. Since knowledge of spatial concepts is dependent upon a number of factors related to concept formation in general, a brief discussion of concepts will follow.

#### Concepts

According to Carroll (1967) "concepts are properties





of organismic experience - more particularly they are the abstracted and often cognitively structured classes of "mental" experience learned by organisms in the course of their life histories (p. 569)." Vinacke (1954) thinks of concepts as being "...cognitive organizing systems which serve to bring pertinent features of past experience to bear upon a present stimulus object (p. 527)." Although Vinacke does not define "a present stimulus object" it would appear that in terms of spatial concepts, the stimulus object could either take the form of actual experience or take an abstract representational form of that experience through means of spoken or written words. This view is in accord with that of Munn (1956) who says "A concept is a process which represents the similarities in otherwise diverse objects, situations, or events (p. 297)."

Concepts fall into two general categories: concrete and abstract. There is a general consensus of opinion amongst investigators that the acquisition of concepts progresses through a continuum from concrete to abstract.

Spatial concepts are abstract in the sense that no concrete form of them can be said to exist. Knowledge of spatial concepts may involve the manipulation of objects but the spatial concepts themselves are only manifested through the observation of the relationship which exists between objects that are in some form of proximity to each other. That is to say, a child cannot see or handle an under but he can see that in relation to a table he may





place himself under it, or he may see another object in that position. Knowledge of spatial concepts is doubly abstract in that it requires in some instances, knowledge of opposites. To understand the concept of being under a table requires also the understanding that, in terms of personal orientation the table is also over one's body. Spatial concepts therefore require knowledge of relationships not only of the orientation of self within the environment but also of those which exist between objects located in space.

### Development of Spatial Concepts

How does concept learning take place? A review of the literature concerned with concepts suggests that the acquisition of concepts cannot be discussed in isolation because the very process is influenced by the varying abilities of each individual. Concept learning occurs as a result of the interrelationships between maturity, intelligence, and language development. In fact in terms of this study a parallel can be drawn between concept learning and reading comprehension because both depend upon factors both, within and without, the individual concerned.

### Age and Concept Development

The acquisition of abstract concepts such as those involving space, evolves gradually as the organism matures. Investigators such as Piaget (1929), Vygotsky (1962), and Bruner (1966), have revealed that children acquire knowledge of different concepts at various stages in their development.



Studying children from their first year of life to adolescence Piaget has shown that adaptation to the environment through intelligence takes place through a series of stages. Children pass through these stages at different rates but each stage follows in successive order. General patterns of age groups are also to be seen. Piaget called the first of these stages the sensorimotor period. This is a stage in which action and external experience are fused (Bruner, 1966, p. 16), Piaget refers to the first part of sensorimotor intelligence as one in which things are "lived rather than thought". Most children pass through this stage during the years of early childhood. The second stage is termed the preoperational stage and extends approximately from the years two to seven. This is the period during which the child begins to comprehend symbols in the absence of objects. The third stage is known as that of concrete operations and the central concept of this period is that of conservation which is defined by Bruner (1966) as "the ability of an individual to be aware of the invariant aspects or properties of objects in the face of transformation (p. 3)." Children in this stage of development are usually from six to eleven years of age. According to Piaget the next stage which follows is that known as the formal operations period and during this period the child develops the ability to deal with the hypothetical as opposed to the real.

As a result of his investigations, Piaget concludes



that concepts in children pass from diffuse, prelogical, subjective forms to more differentiated logical and objective forms.

Vinacke (1954) states that increasing age (signifying accumulation of experience) is the single most important variable in concept formation. Furthermore he lists some of the most important changes which take place with increasing age. A number of these are:

- a) Progression from simple to complex concepts,
- b) Progression from diffuse to differentiated concepts,
- c) Progression from egocentric to more objective concepts.
- d) Progression from concrete to abstract concepts.

Curti (1940) also suggests that concept development takes place as a result of maturity. He sees concept development as progressing through four stages, 1) the presymbolic stage, 2) the stage of presymbolic verbal behaviour, 3) the stage of implicit general ideas, and 4) the stage of explicit generalization.

By means of the Weigl Colour-Form and Sorting Tests, Reichard, Schneider and Rapaport (1944) studied concept formation. Their results showed a steady increase with age growth, in ability to group together objects which belong together and in ability to give abstract conceptual explanations of the groupings.

Sigel (1953) concurs that ability to abstract does not appear suddenly in the course of an individual's development.







He sees it rather as being present from the very beginnings of life and changing qualitatively with progress in maturation.

In a study examining the developmental trends in the abstraction ability, for classifying toys into groups, of boys aged seven, nine and eleven years, Sigel found that the youngest boys showed their more "concrete" nature in their specification of location as a means of determining similarity among objects. These boys were unable to perceive the materials as being independent of specific places or persons. Thus unlike the older boys they were unable to perceive the materials in the "abstract".

Goldstein and Scheerer (1941) found that the abstraction behaviour of very young children appears to take place on a sensorimotor level. They designate this as being perceptual. They believe that the responses given by children are determined by the situation. The nature of the stimuli and the youthfulness of the children decide the form which the organization of the material will take. This behaviour differs from that of older people who tend more towards the conceptual level of abstraction whereby it is necessary to consciously impose organization on the material.

With regard to the formation of spatial concepts in particular Piaget and Inhelder (1967) state that the evolution of spatial relations proceeds both at the perceptual level and at the level of thought or imagination.

"Perceptual space is organized in three successive stages. The first of these is based on topological, the second on



metric and projective, the third on overall relationships bearing upon displacement of objects relative to one another (p. 44)." They further observe that "the transition from perception to mental representation, implied reconstruction of the relationships already grasped at the perceptual level, with functional continuity preserved between the new construction and the earlier perceptual one (p. 44)."

These same researchers found that a six year old child asked to match the position of objects on a toy landscape with objects on another identical model rotated ninety degrees away from the axis of the first has great difficulty in doing so for the child is at the origin of all the coordinate systems that order his perceptual field. He is not able to view the world perceptually from perspectives other than his own.

This view gives support to that of Freeman (1916) who suggested that a child locates objects in space, first, with reference to himself, second, with reference to a second object - the location of which is assumed to be familiar, and third, by means of a system of fixed directions.

It would seem apparent that language involving the use of spatial prepositions is most likely to be involved in the third instance.

Gesell and Ilg (1946) believe that there are marked individual differences among children but that there is a relatively uniform age sequence in the development of major concepts of space and time.



Location has an important role in human thinking. This is shown by the results of a study conducted by Annett (1959). In this study involving 303 children aged five to eleven years, she required the children to classify pictures of common objects by grouping. The explanations accompanying the resulting groups were classified for form and content. It was discovered, that out of the five methods of explanation and four main types of content distinguished, the largest number of explanations involved classification on the basis of contiguity or place. The use of location both as a characteristic of an object and as a means of relating objects with one another was noted. It was further seen that before children can attend to significant similarities of individual objects they have first to analyze their characteristics and consider how these objects are spatially arranged.

The transition from understanding of perceptual space to that of conceptual space takes place over a period of time. According to Piaget (1967) a time lag exists between the two and it is not until after seven to eight years of age that conceptual space marks a real advance on perceptual space. However, although there are differences between the two and despite the time lag between them, both share a common factor; motor activity. In fact "its continuous existence through all the stages renders motor activity of enormous importance for the understanding of spatial thinking (p. 13)." It could be hypothesised that the motor





activity involved in the verbal understanding section of this study may have contributed to the large percentage of correct responses recorded.

In connection with the understanding of spatial concepts comes an understanding and use of words to explain those concepts. Generally termed locative prepositions they are "signs which are related to the way the speakers of a particular language group perceive so-called space (Takahaski, 1969, p. 218)."

Such prepositions are learned as a result of maturation and experience. In terms of genetic appearance in a child's vocabulary, prepositions and simple relational words e.g., on, in, under, appear after proper names, nouns connecting words and verbs (Watts, 1950).

### Language and Concept Development

Piaget (1962) stated that a close relationship exists between children's language and thought. Other investigators have also been concerned with the role which verbalization plays in concept formation, for as Deutsch (1965) says, "Language is the primary avenue for communication, absorption and interpretation of the environment (p. 79)."

Although concept learning can take place in the absence of language (Carroll, 1967), a concept is usually organized as result of a group of related sensations, percepts and images with a label, usually a verbal symbol, or symbols, attached to them (Russell, 1956). Dewey (1910) said "the understanding of a concept can only be said to be established





when the meaning (of it) is sufficiently individualized to be directly grasped and readily used, and thus fixed by a word (p. 60)."

The processes leading to concept formation develop along two main lines. The first is complex formation and the second is the formation of potential concepts. In both, the use of words is an integral part of the developing processes, and the word maintains its guiding function in the formation of genuine concepts to which these processes lead. (Vygotsky, 1962, p. 81).

It is through language that a child becomes aware of spatial relationships - the words give the child the symbols, or the linguistic forms whereby it is usual to symbolize these relationships (Lewis, 1963).

In summing up the results of experiments by Natadze (1951), Kolodnaya (1954), Kladnitskaya (1956) and others, Shemyakin (1954) states:

The development in man of the differentiation of the "up-down", "forward-backward", and "right-left" directions is a long and complex process. At its basis are the motor differentiations and coordinations which are linked with the indications provided by the external senses and the vestibular apparatus. Only after this differentiation has practically formed in the child do the connections between the above mentioned space directions and the words which designate them become fixed (p. 215).

In terms of language development Jespersen (1922) cites Stern as reporting that children have been noted to use prepositions at the age of twenty-two months. Bruner (1966) says that the last thing to enter the child's vocabulary are



the functors - to, on, at above, etc. He terms these as being the "small coin of relational representation (p. 8)."

The fact that a child has difficulty in grasping the symbolic representation of abstract relations that depict neither images nor actions may account for the late appearance of such words as those denoting location.

Ames and Learned (1948) investigated the development of verbalized space in children of nursery school age. They discovered that children first understood prepositions where they formed part of a phrase involving an object. For example, in the box, under the table, and, on the bed were understood prior to in, on and under as separate words. Thus it can be seen that the development of spatial understanding involving the use of verbal labels proceeds from the concrete to the abstract.

Support for this view is given by Mukerji (1968) who sees three levels of understanding being involved in the acquisition of spatial concepts. The levels are

1. Learning object-to-object spatial relationships in a motoric way (e.d. putting a cup on the table)
2. Recognition of position of objects without actual manipulation
3. Recognizing positions in space from pictures and verbalizing the spatial relationship.

It could be hypothesized that yet another level exists wherein the child recognizes positions in space from printed words and comprehends the relationships between objects



depicted by those words. This form of understanding would be necessary in order to follow printed directions such as, "Find the road that goes between the trees near the river".

Such a level of understanding would entail greater abstraction of thought than any of the other three.

In (1969) McLeod examined kindergarten children's understanding of twenty prepositions through three modes of stimulus response: non-verbal, controlled-verbal, and free-verbal responses. She found that pre-school children are able to understand certain prepositions of spatial position when they occur in natural context, but that the same children do not appear to use spatial prepositions in their speech. She found that for all three modes of response required, only one preposition, out, was given correctly. Furthermore, she discovered that throughout the Free-Verbal response section of her test, children used repetition of the preposition as an aid to memory for solving problems. McLeod did not define "natural context" so it is possible that the understanding which the children demonstrated was limited to the specific context presented to them.

Johnson (1970) also investigated children's ability to understand the meanings of such prepositions when presented orally. She extended her study to include children in grade one and two. She discovered an increase in children's ability at each grade level to demonstrate understanding of spatial position and that the attainment of spatial concept relationships is a developmental process. Furthermore, she







found that children between the ages of five and eight years have a better understanding of spatial prepositions in non-verbal situations than in speech. This would, therefore, suggest that where the children are given concrete situations involving the use of objects to demonstrate understanding they have less difficulty than in more abstract situations such as in conversation where the ability to conceptualize spatial relations is dependent upon a higher degree of symbolization. Such findings would suggest that reading understanding of words of this nature would also be more difficult since reading involves the application of thinking in an even more "abstract" sense than that of verbal (aural) symbols.

Whilst it can be seen that language development influences the acquisition of the terms of spatial relationships, it has been noted that the development of language itself is influenced by other factors.

#### The Relationship of Intelligence to the Understanding of Spatial Concepts

Concept development, which is closely allied with language development, is itself dependent upon intelligence, for the mental processes necessary for concept formation and development require a corresponding ability to think both on a concrete and abstract level.

Stern (1914) defines intelligence as a general capacity of an individual consciously to adjust his thinking to new requirements: it is general mental adaptability to new problems and conditions of life. Tasks such as those



involving the manipulation of objects to demonstrate understanding of spatial prepositions require a child to adjust his thinking to new requirements.

Thorndike (1921) considered general intelligence to be comprised of adjustment to abstractions, to social relationships, and to mechanical or concrete problems.

In considering the understanding of spatial relationships particularly those which are doubly abstract by virtue of their being represented through print, it can be seen that ability to think in abstracts (one manifestation of intelligence) is likely to be of importance. That boys with limited intelligence find the understanding of spatial words such as up, down, front, back, lower, higher, right and left difficult, was discovered by Lanegran, Snowfield, and Laurent (1970). In a study which attempted to establish the lower limits of the ability of boys whose mental ages ranged from three to thirteen (chronological ages: eight to seventeen years) to demonstrate or verbalize comprehension of concepts of distance and direction, it was hypothesized that the sole controlling factor in comprehension and verbalization of spatial concepts is intelligence. To test the effect of intelligence as a limit, intelligence quotient was correlated with ability to demonstrate spatial understanding. The results of this experiment show that the children with the lowest mental ages were able to demonstrate the concepts of front and back and up and down but not of left, right or higher or lower. (In fact, these boys were not tested on



some test concepts because they failed simpler spatial demonstrations). The results also show that intelligence could be explained as a controlling factor in one third of the forty boys tested. It was, therefore, stated that intelligence was not the sole controlling factor in the ability to demonstrate distance and direction concepts. It can be seen, however, that if the least intelligent children had only a limited understanding of a few spatial concepts, intelligence is a factor to be considered as an influence on the understanding of spatial concepts particularly in the abstract medium of print. It would further appear that ability to understand prepositions which are not being used in conjunction with the individual's own orientation in space is likely to require the ability to think in abstracts. Since reading understanding of spatial prepositions requires abstract thinking, it is probable that a correlation between intelligence and reading understanding of those prepositions is likely to be found.

Terman (1916) said that intelligence was the individual's capacity to think abstractly and to use abstract symbols. Reading is a thinking process since it involves the use of abstract thinking for the understanding of abstract symbols. In order to comprehend the spatial concepts found in print it is necessary to be able to translate those abstract symbols back into the actual situations described. In using spatial prepositions the author translates actual situations into the abstract through symbolic





representation and the reader must convert the abstract symbols back again into the original events. Without a well established ability to think in abstracts the reading understanding of the relationships among objects which is manifested by spatial prepositions is likely to be inaccurate.

Although no studies correlating intelligence with the reading comprehension of spatial prepositions, in the absence of concrete stimuli, have been recorded, two recent studies correlating intelligence with verbal understanding of such prepositions, have been undertaken. McLeod (1969) using a Peabody Picture Vocabulary Test (1965) found that children of high intelligence had a superior grasp of spatial prepositions than did children with low intelligence. Johnson (1970) used the California Short Form Test of Mental Maturity as her measure of intelligence because she also considered intelligence to be a variable likely to affect young children's understanding of prepositions of spatial position. She discovered that in grades one and two there was a significant correlation at the .001 level between intelligence and performance on the Spatial Prepositions Test in all three modes of stimulus response. She further found that in her kindergarten children, total intelligence scores were significantly correlated with ability to perform on the Verbal (Oral) - Verbal (Oral) portion of the Spatial Prepositions Test. (Johnson measured intelligence by means of verbal and non-verbal tests). She also found that when the total test sample was considered, pupils with higher intelligence scored





better than students with lower intelligence on the Verbal (Oral) - Verbal (Oral) Test. (For purposes of comparison with this study it should be noted that Johnson's Verbal (Oral) - Verbal (Oral) Section of her tests involved the demonstration, by the examiner, of a spatial preposition using a ball or hoop, and required the child to describe the spatial position shown).

### Experience and Spatial Concepts

The development of spatial concepts is dependent upon maturity, cognitive growth and language development. The influences upon language (which is the means whereby an individual internalizes his conceptual understanding) also determine the kinds and qualities of the concepts learned.

One of the greatest influences upon language and concept development is the environment in which a child lives. For a child in the elementary grades this environment would primarily include that of his home and school.

According to Vygotsky (p. 68) verbal intercourse with adults becomes a powerful factor in the development of a child's concepts. Deutsch (1965) lends support to this view for he sees the operative influence on the child's language development as being the active verbal engagement of people who surround him. Culture and experience determine the meaning assigned to concepts and determine what concepts need to be learned (Sax, 1969).

In a study undertaken to establish that cultural deprivation must account for deficiencies in experience and



in conditions of learning, and that these effects of deprivation were discernable in the language development of individual pre-school children. Wight, Gloniger and Kieve (1970) required two different kindergarten groups (one from a private school and one from a poverty area) to name vegetables. The results showed a differential development in the use of language between the two groups. The children from the poverty group were less able to name vegetables eaten or seen. Efficiency of naming was developing at a faster rate amongst the private school children. The investigators concluded that the problems in linguistic development are a product of the restricted experience and the cognitive style of "thinking learning" within the home.

Since the understanding of spatial prepositions requires not only experience with spatial concepts but also experience with the wide variety of situations in which specific prepositions can be used, it would appear that experiences within the home environment would influence the range of meanings or uses known. Thus in cases where language is used in a convergent or restrictive fashion recognition of spatial prepositions in a variety of contexts, particularly those in print, would likely fail to take place. Bernstein (1960) sees the convergent or restrictive form of language as being indicative of children from so-called deprived homes.

The relationship of background experience to reading success has been investigated by a number of researchers.



It has been noted that children with rich experiential backgrounds had higher scores on reading tests than children from meagre backgrounds (Hilliard and Troxell, 1937).

The influence of the school and in particular the teacher on experience has been shown by McWhorter (1935). She enriched the experiences of children from impoverished backgrounds and discovered that it was possible to raise their reading levels in consequence.

Smith (1963) states that the first step in building a concept is that of having experiences. "A concept is the residue left as a result of experience; it is the condensation of experience which takes definite form in the mind (p. 287)." She goes on to point out that experiences on their own are not enough. She believes that it is the classifications or summaries derived from experiences (which are the end product of drawing conclusions from a number of experiences) that should be labelled concepts. It can be seen that where teachers provide a wide variety of experiences in the classroom, greater understanding of concepts, particularly those which are abstract in nature, is likely to ensue. Spatial prepositions experienced in a variety of contexts should for example have an effect upon a child's ability to comprehend them when he encounters them in print. In fact, as a result of a study of the various methods and materials involved in the teaching of reading in the United States, Bond and Dykstra (1967) discovered that the variable most likely to be of significance in aiding a child to read







is the teacher. Thus school experience can be considered likely to influence a child's scores on a preposition test.

#### The Effect of Sex on the Understanding of Spatial Concepts

Only a few studies have been noted to examine the effect of sex on the understanding of spatial concepts. Research studies have shown, however, that in terms of a child's language development girls generally score higher on tests of language than do boys who are of the same grade level. In the use of syntactical structures, O'Donnell, Griffin and Morris (1967) found that there was a slight tendency for girls to score higher on the written responses and for boys to score higher on oral responses. McCarthy (1931) in studying children's use of prepositions found that "no consistent sex differences appear in this part of speech (p. 117)." McLeod (1969) found that males scored lower on all aspects of the McLeod Preposition Test and suggested that girls appear to have a better knowledge of spatial prepositions than do boys. Johnson (1970) found that ability to understand prepositions of spatial position does not appear to be influenced by sex differences. She stated that boys and girls performed equally as well on all portions of the Spatial Prepositions Test.

#### IV. SPATIAL PREPOSITIONS AND FACTORS IN PRINT AFFECTING THEIR UNDERSTANDING

As has been pointed out above the ability to read is dependent upon factors within the reader. The printed word,



however, contributes factors of its own which to a greater or lesser degree restrict the amount and quality of comprehension experienced by the reader. Goodman (1968) defines reading as, "the receptive phase of written communication."

He says,

In written language a message has been encoded by the writer in graphic symbols spatially distributed on the page. The reader does not merely pass his eyes over written language and receive and record a stream of visual perceptual images. He must actively bring to bear his knowledge of language, his past experience, his conceptual attainments on the processing of language information encoded in the form of graphic symbols in order to decode the written language. Reading must, therefore, be regarded as an interaction between the reader and written language, through which the reader attempts to reconstruct a message from the writer (p. 15).

It is this 'interaction', to which Goodman refers, which is often a source of difficulty to the inept, or inexperienced reader, for in order to have this interaction, (or transaction as Rosenblatt (1969) calls the relationship between the reader and the text), take place the reader must possess similar language competence to that of the author. Where this 'transaction' fails is when the reader, even though able to "break the code" is unable to bring meaning to bear upon the deciphered code.

Many definitions of reading have been recorded during the past fifty years. In 1917, Thorndike referred to reading comprehension as being

...a very complex procedure involving a weighing of each of many elements in a sentence, their organization in proper



relation to one another, the selection of certain elements of their connotations and the rejection of others and the co-operation of many forces to produce the final response (p. 323).

It would appear that the understanding of spatial prepositions in print does indeed involve 'a weighing of each of many elements in a sentence' since spatial prepositions have been noted as being the means whereby a wide variety of abstract relations are expressed (Brook, 1958).

In a study by Simons in 1970, the author discussed a number of approaches to measuring reading comprehension. He maintained that the means used to evaluate a person's understanding of what he has read, reflects the evaluator's reading theory. Simons considered "reading comprehension" should be considered as one aspect of understanding language, which he considered to be best represented by Chomsky's model of transformational generative grammar. According to this theory a sentence is represented on two levels - a surface (phonological or graphemic) level and an underlying or abstract level. In order to understand a sentence, a reader must recover the sentence's deep structure which is supposedly the meaning bearing part. Simons (1970) attempted to measure reading comprehension based on this theory by having pupils select from a group of three sentences, those two which conveyed the same meaning, that is, were paraphrases of each other\* (assuming that sentences which convey the same

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\* One of the three tests used in this study to measure reading comprehension of spatial prepositions was of this type.





meaning must have the same underlying structure regardless of the surface structure representation).

There are many factors within the language of print which may interfere with a person's recovering the deep structure of a sentence and in some instances a person may derive meaning by the use of surface clues only.

Some difficulties in handling the language of print have been pointed out in studies by Strickland (1962), Rinne (1967), Robertson (1966), and Fagan (1969). Strickland (1962) analyzed basal reader series to determine sentence patterns. She compared the patterns she found with the oral language development of children in grades one to six. She found that where the language of print was similar to the language of the children, greater reading success resulted. Rinne (1967) discovered a high correlation between pattern awareness and literal comprehension in reading.

Robertson (1966) investigated middle grade children's understanding of connectives. She analyzed the content of basal readers to identify the connectives used and the sentence structures containing them. Using tests containing those connectives identified within the same sentence structures she found that the understanding shown by grade four, five and six students was limited to fifty-seven percent, sixty-six percent and seventy-four percent respectively. Since connectives are function words which appear with considerable frequency in print it can be seen that children of these ages must be handicapped when reading even the most 'controlled' texts (Basal readers are usually





subject to more vocabulary control than are science or social studies texts so it might be assumed that reading in the content areas would result in less understanding by these children).

Fagan (1969) examined the language of three basal reader series at the grade four level in terms of the numbers and types of transformations which were contained within that language sample. He discovered that the type of transformation which had been applied in the derivation of the sentence was an important variable affecting the degree of understanding which children at the grades four, five and six levels derived from sentences and prose passages.

From the evidence provided by these studies it can be seen that the understanding of spatial prepositions in print is likely to be influenced by many of the above mentioned variables that are contained within the printed page itself.

It was hoped that through the use of "cloze" procedure and paraphrase technique some light might be shed on children's understanding of spatial prepositions, embedded in unrelated sentences and in a story.

Research into children's understanding of spatial prepositions in print is conspicuous by its absence and although many investigators such as McCarthy (1930), Grigsby (1932), Kladnitskaya (1956), Luiblinskaya (1957), Feofanov (1966), McLeod (1969) and Johnson (1970) have investigated children's listening understanding of spatial prepositions only Johnson, (1970) attempted to include a measure of



children's ability to comprehend these prepositions in a reading situation. Unfortunately, since she required her students to manipulate objects to demonstrate their understanding of the spatial prepositions presented in her sentences, little abstraction of thought was required. In fact, it could be argued that Johnson's test of the reading comprehension of spatial prepositions was really a test of verbal understanding since she gave aid whenever necessary in the identification of words.

Furthermore, Johnson stated that whilst 'up' and 'left' have multiple meanings she only tested "one meaning of the word, that of spatial position (p. 60)." From the results of this current study it is suggested that the context in which a preposition is placed lends a variety of shades of meaning to that spatial preposition so that many spatial prepositions themselves have a number of different spatial meanings.

Since Johnson, in her implications for further research, maintained that research "which focused more on reading aspects", was necessary an attempt was made by the present investigator to examine the children's understanding of abstract spatial concepts found in reading.

## V. SUMMARY

This chapter reviewed the literature which was pertinent to the understanding of spatial prepositions. A brief history of prepositions, their function and importance



was described.

Those variables such as conceptual ability, intelligence, language, experience, and sex, which were seen to be factors contributing to the development of spatial concepts were examined. It was discovered that a relationship exists between all of these variables and the development of spatial concepts. The major conclusion drawn was that the development of spatial concepts increases as the organism matures and progresses from concrete to abstract understanding.

The final section of this chapter considered those factors within the printed page which can inhibit the reading understanding of such prepositions. Author style, context, semantic structure and embeddedness of ideas were all found to contribute to the inexperienced or inept reader's difficulty with reading in general.





## CHAPTER III

### THE EXPERIMENTAL DESIGN

This chapter contains a description of the design of the study, the pupils who participated in the experiment, the data relevant to the study, the collection of the data, the pilot study and the statistical treatment.

#### I. EXPERIMENTAL DESIGN OF THE STUDY

The investigation of children's understanding of spatial prepositions both aurally and through reading was the purpose of this study. The treatment involved the use of four prepositions tests devised by the examiner. A description of these tests is given in the section concerning collection of the data. These tests were constructed to facilitate the collection of the data concerning the listening and reading understanding of spatial prepositions and were completed by pupils in grades two to four in the schools of St. Albert School District #6.

The variables considered in this study were: grade, chronological age, sex, reading achievement, and intelligence.

Computation of correlations and analyses of variance were the main statistical techniques used to analyze the data.

#### II. THE SAMPLE

This section will contain an overview of the



population from which the sample was taken. The age, grade, and sex of the children who participated will be described.

### Sample Selection

The population for this study consisted of pupils in grades two, three, and four in the schools of St. Albert School District #6. There are four schools in this district with pupils in the grades indicated. One school was selected for the pilot study and thus was eliminated in drawing the sample for the main study. Of the three remaining schools, two had a larger number of classes per grade. One of these schools has students in grades one to three, whereas the other serviced these students from grade four to six. Because of the larger number of classes per grade and ease of access, the sample was chosen from these two schools.

Since an attempt was made to control for the word recognition ability of the students of the study, the sample was drawn on the basis of the results of the Gates-MacGinitie Reading Tests, which were administered by the examiner. It was assumed that children with a minimum reading level of grade 2.6 would be able to recognize the words of the prepositions tests, and thus was used as the cut-off point for sample selection. Twenty pupils (ten boys and ten girls) were then randomly selected from each grade level, children who had repeated or who were repeating a grade were excluded from the study. The number of boys and girls by grade are given in Table I while the mean reading grade for each group may be found in Table III, p. 59.



TABLE I

## TEST SAMPLE BY GRADE AND SEX (N=60)

Grade	Boys	Girls	Total
Two	10	10	20
Three	10	10	20
Four	10	10	20
Totals	30	30	60

Although consideration was given to the effect which socio-economic status of the children might have upon this study, the fact that the population in St. Albert tends to be of a fairly uniform middle class level precluded this form of grouping. Furthermore Johnson (1970) stated that socio-economic status by itself does not appear to influence significantly ability to grasp prepositions of spatial position.

## III. DATA PERTINENT TO THE STUDY

The Prepositions Tests

A total of four prepositions tests were administered to the children in this study. Three of them were constructed by the investigator, whilst the fourth was a modified version of the story in the McLeod Prepositions Test. A description,

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\* See Appendix A for copies of all prepositions tests.





purpose and procedure for administration for each test follows.

### The Spatial Prepositions Listening Understanding Test (SPLUT)

This test consisted of twenty sentences in which were embedded, the spatial prepositions\* contained in the McLeod Prepositions Test. Each sentence contained only one of these prepositions. An attempt was made to control the vocabulary level of the words in each sentence, and the structure.

The administration of this test required that use be made of three-dimensional toys since in order to demonstrate understanding of the sentences which were presented orally by the examiner, each child had to manipulate the toys provided into the correct position denoted by the spatial preposition.

### Description of the Models

The toys used in this section of the test included those which were considered to be of interest to the children. Since they formed part of the toy collection of the investigator's children, unnecessary expense was eliminated. (Furthermore for purposes of duplication, the toys can all be purchased from local department stores). Toys included were:

- one dump-truck station
- one ferris wheel

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\* See Chapter I, page 6 for these prepositions.



two men

one boy

one girl

two dogs

two cars and three trucks

one aeroplane

a model tiger, elephant and crocodile

a model fence

four wooden blocks

The dump-truck station, which was called a service station after common usage, was displayed on a table together with the ferris wheel and the zoo. The zoo consisted of four wooden blocks, and the fence. Enclosed within the zoo fence were the crocodile, the elephant, and the tiger. The rest of the toys were placed in a box beside the service station.\*

#### Purpose of the SPLUT

The purpose of this test was to discover whether each child could understand the meaning of each spatial preposition that was presented to him in a spoken sentence form by the examiner.

#### The Reading Tests of Spatial Prepositions Understanding

An attempt was made in this study to investigate children's understanding of spatial prepositions in written

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\* See Appendix B for a picture of the toys and their arrangement for testing.



context by means of three different tests since it was hypothesized that the understanding which children might demonstrate would in part depend on the type of response required and the context in which the spatial prepositions were placed. Furthermore, it was hoped that the tests used could be controlled sufficiently to exclude any extraneous factors which might influence the findings. Factors given consideration were word-recognition ability and sentence structure.

The three tests used to examine spatial preposition understanding in reading were as follows:

1. The Spatial Prepositions Paraphrase Test (SPPT)

This test contains twenty key sentences, each of which contains a different spatial preposition. Accompanying each key sentence are four sentences labelled A. B. C. D. One of these sentences is a paraphrase of the key sentence whilst the other three are distractors. As with the SPLUT, vocabulary and structure were controlled to keep both as close as possible to the Grade II level.

Ability to select the sentence paraphrasing the key sentence in each item was considered to be evidence that the subject understood the spatial preposition embedded in the key sentence.

Purpose of the SPPT.

The purpose of this test was to discover children's ability to understand spatial prepositions embedded in written context. One of the means whereby understanding of reading can be measured is through translation into another





form.

Such a technique, as a measure of reading comprehension, was used by Simons (1970). In a study concerned with the relevance of a specific linguistic concept - deep structure - to reading comprehension Simons examined the ability of eighty-seven fifth grade students to recover the deep structure of sentences. He found that their ability to do this was positively related to their reading comprehension. By means of the Deep Structure Recovery Test (DSRT) which was designed to measure the students skill in recovering the deep structure of sentences, Simons examined the students ability to choose the one sentence out of the three in each item which was not a paraphrase of the other two sentences. He states:

In each item two of the sentences have the same deep structure while a third sentence, although superficially familiar to at least one of the other two sentences, has a different deep structure and thus a different meaning, for example,

- \*a) What the boy would like is for the girl to leave.
- b) For the boy to leave is what the girl would like.
- c) What the girl would like is for the boy to leave.

In order to understand the ideas expressed by the words in the surface level of a sentence, the reader must recover the deep structure of that sentence. It has been hypothesized that sentences with the same meaning do not

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\* The asterisk indicates the sentence with the different deep structure.



differ at the deep structure level. Therefore, it is assumed that if the child selects those two sentences which are paraphrases of each other, he has successfully recovered the deep structure and has consequently comprehended the ideas and relationships which the sentences convey.

For example: The bottom shelf is below the top shelf.

- A. The top shelf is above the bottom shelf.
- B. The bottom shelf is higher than the top shelf.
- C. The shelf at the bottom is above the top shelf.
- D. The bottom shelf is above the top shelf.

Although (A) has a different surface structure from the key sentence, the deep structure is the same since (A) means the same as the key sentence.

## 2. The Spatial Prepositions Sentence Completion Test (SPSCT)

This test also contains twenty sentences. Deleted from each sentence was the spatial preposition or prepositional phrase. For every word that was deleted a line was substituted thus:

Father held a surprise parcel — his back.

### Purpose of SPSCT

The purpose of this test was to determine children's reading understanding of spatial prepositions within the context of a sentence. The measure used for the purpose was "cloze" procedure.



## Cloze Procedure

The term "cloze" procedure consists of the deletion of words from a sentence or passage according to some objectively specifiable process. Words are generally deleted in either of two ways: either every nth word, or words of a particular type (lexical, structural) are deleted. Blanks of uniform length are substituted for the deleted words. By accepting those insertions made by the subjects which match the deleted words or by accepting synonyms in place of the deletions a score can be recorded (Fagan, 1969).

The criterion for the "cloze" procedure used in both the Spatial Prepositions Sentence Completion Test and The Spatial Prepositions Story Completion Test was based on deletion of words of a particular type: namely all spatial prepositions. Since a number of the required spatial prepositions were phrasal in nature, for example 'in front of', the usual procedure of inserting a blank into the sentence in place of the deleted word was changed and for every word required a corresponding number of lines (of uniform length) were substituted.

A sentence such as Mary sat in front of the fire was presented thus: Mary sat — — — the fire.

In the Spatial Prepositions Story Completion Test "cloze" procedure was selected because it has been found to be a reliable measure of specific word understanding. Bormuth (1967), in attempting to determine the possibility of obtaining useful readability formulae for measuring the





readability of individual words and sentences, used "cloze" procedure as his readability measure. On the basis of his findings he concluded that, at the word level of analysis, the independent clause level of analysis, and the sentence level of analysis "cloze" procedure was a useful measure of comprehension difficulty.

The "cloze", however, has mainly been used with children in grades four and above. Since the pupils in this sample were above average readers and since the "cloze" results were being analysed descriptively, the "cloze" was considered to be a valid measure for this study.

### 3. The Spatial Prepositions Story Completion Test (SPStCT)

The story used in this test was adapted from Clancy the Curious Pig which formed part of the McLeod Prepositions Test. The story in its original form was read by McLeod to the kindergarten children in her study. As she manipulated objects, mentioned in the story, into position she required the children to supply the spatial prepositions which she omitted.

In the present study the story was presented to the children in printed form and use was made of "cloze" procedure to delete the spatial prepositions. Several words which were considered to be of greater difficulty than the grade two level were replaced by simpler ones. It should be noted that eighteen of the twenty prepositions occurred in this test.



### Cloze Procedure in SPStCT

"Cloze" procedure was used as a measure of passage comprehension. The use of "cloze" procedure for this purpose has been demonstrated by Jenkinson (1957), Robertson (1966), and Fagan (1969). Among the reasons given by Jenkinson for selecting such a procedure for a comprehension measure of a printed passage and which appear to be most pertinent to this study are:

- 1) It appears that an individual's ability to complete a "cloze" test depends upon the extent to which he understands the meaning of the passage, and thus on the various factors generally included in comprehension, as well as on the knowledge of vocabulary and general language ability.
- and,  
2) Russell (1956) suggests that the process of concept formation "involves inductive thinking, and at least some deductive and creative thinking to clarify and verify the structure of the concept". Analysis of the process of the "cloze" procedure reveals that these types of thinking are brought into play on the verbal level.

On the basis of a review of research investigating the reliability and validity of the "cloze" procedure as a measure of reading comprehension undertaken by Fagan (1969), he concluded that there was sufficient evidence to warrant its use as a comprehension measure.

### The Purpose of the Spatial Prepositions Story Completion Test

The purpose of this test was to discover children's



understanding of spatial prepositions contained within the context of a story. Since as Smith (1963) says the meaning of a word is dependent upon the context in which that word is found and since comprehension often requires the holding in mind of related ideas (Miller, 1965), it was thought that this form of test would most closely duplicate a normal reading situation (bearing in mind, of course, that words are not deleted from the page in normal use).

### Vocabulary Control

The vocabulary of all of the reading tests of spatial prepositions understanding was found to occur within the first 3,000 words of the Lorge and Thorndike list of 30,000 words. This placed them at a grade three level of difficulty. Since the cut-off point for sample selection was grade 2.6 and because testing took place at the end of the school year it was reasoned that a grade three level of difficulty was acceptable for use in the spatial prepositions tests.

Words used in the three tests which were not found within the first 3,000 words of the above list are noted as follows:

Spatial Prepositions Completion Test: goldfish, parcel, lipstick, spider.

Spatial Prepositions Story Completion Test: rooster, ladder, tractor, haystack.

Spatial Prepositions Paraphrase Test: spinning, shelf, underneath, toe, puddle, playground, tunnel, cage, doorway, plane, fisherman, and blackbird.





The use of "cloze" procedure and paraphrase techniques as measures of children's ability to understand spatial prepositions in reading, however, does not eliminate the possibility that other factors may influence this particular kind of reading comprehension. The structural arrangement of words in a sentence, the organization of a related group of sentences, and the context in which words are embedded, are all significant contributors to understanding (Smith, 1963, p. 61). It can be seen that spatial prepositions, particularly since they "bind together the significant and expressive words" (Classen, 1969) of our language, and because they often signify the relationships between objects and action, require the reader to be able to handle spatial concepts in a medium twice removed from reality.

### Intelligence

Since it was thought that intelligence might be a variable influencing children's understanding of spatial prepositions, a measure of intelligence was undertaken.

The intelligence quotients of the students in this study were obtained through the administration of the California Short Form Test of Mental Maturity (1963). Grade two students were given Level I and grade three and four students were given level IH.

According to the authors of the test, rate and scope of mental development at each level of this test is measured in terms of four factors: logical reasoning, numerical



reasoning, verbal concepts and memory. The seven subtests which comprise the total test are grouped under two categories: Language and Non-Language. Intelligence quotients for both sections were obtained in this study as was a total I.Q. score.

Although Stanley (Buros, 1968) states that the CTMMS-Form is considered to be most useful at kindergarten through grade three and progressively less useful thereafter, as a result of its emphasis on non-verbal material this test was still chosen for the grade four students because a) it was necessary to give all children in the study a comparable test, and b) because it was used as an intelligence measure by Johnson (1970) in her study concerning children's understanding of spatial prepositions.

The grade three students have the highest mean total, language and non-language intelligence quotients whilst the grade four students have the lowest total, language and non-language intelligence quotients. (Table 2).

At the grade three and four level the boys have lower intelligence quotients in all areas tested than do the girls. This pattern is reversed in grade two where the boys have higher total and non-language intelligence quotients than the girls. Grade two boys and girls have the same language intelligence quotients.

### Reading Achievement

The ability to understand spatial prepositions was thought to be similar to that required for reading so a correlation with a reading achievement measure was considered



TABLE 2

MEAN I.Q. SCORES AS MEASURED BY THE CALIFORNIA  
SHORT FORM OF MENTAL MATURITY BY GRADE, AND SEX

	LANG I.Q.		NON-LANG I.Q.		TOTAL I.Q.	
<u>Grade Two</u>						
Boys	110		116		115	
Girls	110		111		113	
Total Grade		115		113		114
<u>Grade Three</u>						
Boys	118		115		119	
Girls	121		119		124	
Total Grade		119		117		122
<u>Grade Four</u>						
Boys	110		105		109	
Girls	116		113		118	
Total Grade		113		109		113

to be desirable in this study.

The measure of reading achievement used in this study was the Gates-MacGinitie Reading Tests (GMacGRT), Primary B and C were used for children in grade two and three and Survey D was used for grade four children. Each level of this test consists of two sections: Vocabulary and Comprehension. The grade four level also included a Speed and Accuracy section. This section was not included in this study.

The Vocabulary section, at all levels, measures a child's ability to recognize or analyze isolated words of





increasing difficulty.

The comprehension section measures a child's ability to read and understand sentences and paragraphs.

Reading achievement scores used in this study are the scores for each section of the Gates-MacGinitie Test.

The Gates-MacGinitie Reading Tests were chosen for use in this study for the following reasons:

- a) Johnson (1970) used these tests as a measure of reading achievement in her investigation of spatial prepositions understanding of grade two children. These tests are commonly used in school systems for assessing reading achievement,
- b) These tests are a revision of the Gates Reading Tests and have not yet been reviewed in Buros Mental Measurement Yearbook but according to Hopkins (1965) the Gates Reading Tests had excellent reliability and were useful survey measures of reading achievement. He was referring in particular to the Gates Advanced Primary Reading Tests on which the Gates-MacGinitie Reading Test - Primary B was based. In speaking of the Gates-Reading Survey, on which the Gates-MacGinitie Primary C and Survey D were based, Wantman (1965) is of the opinion that it, (the survey) is useful for determining reading competence levels for groups of pupils and that the material used in the tests has face validity.

The authors of the Gates-MacGinitie Reading Tests state that these tests give lower grade and percentile scores than



TABLE 3

MEAN READING ACHIEVEMENT GRADE SCORES FOR VOCABULARY  
AND COMPREHENSION BY GRADE AND SEX

	VOCABULARY		COMPREHENSION	
<u>Grade Two</u>				
Boys	4.4		4.3	
Girls	3.9		3.7	
Total Grade		4.1		4.0
<u>Grade Three</u>				
Boys	4.7		4.7	
Girls	5.1		5.0	
Total Grade		4.9		4.8
<u>Grade Four</u>				
Boys	5.6		5.3	
Girls	5.1		5.0	
Total Grade		5.3		5.1

This table shows that the grade two students have the highest level of reading vocabulary achievement when their mean score is compared with the criterion grade score\* for their grade level. The boys in grades two and four had superior vocabulary and comprehension grade scores to the girls. At the grade three level the reverse was noted. Girls had superior scores to the boys.

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\* Selection of students in this sample was based on a criterion grade score of 2.6, 3.6 and 4.6 for grades two, three and four respectively on the G-McGR Tests.



the 1958 Gates Reading Tests because increased interest and attention were given to the teaching of reading between 1957 - 1958 and 1964 - 1965. They suggest that the average child in 1964 - 1965 was a more capable reader than his counterpart in 1957 - 1958.

#### IV. COLLECTION OF THE DATA

The data for this study was collected during the period from April 27, to May 10, 1971.

As well as the four prepositions tests both the Gates-MacGinitie Reading Tests and the California Short Form Test of Mental Maturity were given.

The Spatial Prepositions Tests were administered in random order except for the story comprehension test which for purposes of convenience was administered first to all children on a group basis. There was a lag of approximately one week between the administration of this test and the other prepositions tests.

The listening understanding, sentence paraphrase, and sentence completion tests were randomized according to the following manner for grade two and three students.

Child A - listening understanding, paraphrase, sentence completion

Child B - paraphrase, sentence completion, listening understanding

Child C - sentence completion, listening understanding





paraphrase, and so on.

The grade four children were tested on a group basis for the sentence completion and sentence paraphrase tests. Children within each group tested were randomly selected to determine which of these tests they would receive first.

It was hoped that randomization of test order would preclude the results from being influenced by a particular sequence of testing procedure.

#### Testing Procedure for SPLUT

The procedure for testing required the child to place the toys in the position indicated by the sentence read to him.

For example: The dog ran around the ferris wheel.

Here the child was required to make the toy dog circumnavigate the ferris wheel. Where the child demonstrated this ability he was recorded as making a correct response. Prior to the commencement of the test each child was allowed to examine the toys and was given a test sample to complete. Where the child expressed doubt or requested to have the sentence repeated the examiner read the sentence again. Data was recorded in a test booklet and testing was undertaken on an individual basis.

#### Testing Procedure for SPSCT

This test was administered on an individual basis to grades two and three and on a group basis to grade four. The grade two and three students responses were oral whilst



the grade four students responses were written.

### Testing Procedure for SPStCT

This test was administered on a group basis to all the children in the study. The children were required to write their choice of word in the appropriate blank space.

### Testing Procedure for SPPT

Each child was required to read each key sentence and the four beneath it and then to make his response. This response was in oral form for grades two and three who were tested on an individual basis, and in written form by means of circling the letter preceding the correct response for grade four who were tested on a group basis.

### The Pilot Study

A pilot study involving nine students (three from each of grades two, three and four) was carried out in February, 1971. An attempt was made to clarify problems concerning:

1. The approximate time required for completion of the procedures involved in testing aural understanding and reading comprehension of spatial prepositions,
2. the suitability of the items used,
3. the suitability of test directions,
4. the establishment of guidelines in selecting the sample.

The pilot study revealed the need for:

1. A period of approximately thirty minutes for testing purposes,

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part outlines the various methods and tools used to collect and analyze data. It mentions the use of surveys, interviews, and focus groups to gather information from stakeholders. Additionally, it discusses the application of statistical software to process and interpret the collected data.

3. The third part describes the results of the data analysis. It highlights the key findings and trends identified, such as the increasing demand for certain services and the need for improved communication channels. It also notes the areas where the organization is performing well and the challenges it faces.

4. The fourth part provides recommendations and suggestions for future actions. Based on the findings, it suggests implementing new initiatives to address the identified needs and challenges. It also recommends regular monitoring and evaluation to ensure the effectiveness of the implemented measures.

5. The final part of the document concludes with a summary of the overall findings and a statement of commitment to continuous improvement. It expresses the organization's dedication to staying up-to-date with the latest trends and technologies to provide the best possible service to its stakeholders.

2. a change in one section of the instrument being used
3. restricting the population to students who have not repeated a grade.

## V. TREATMENT OF THE DATA

All tests were scored by hand by the investigator. Reading vocabulary and comprehension grade scores were obtained from the Gates-MacGinitie Reading Tests and intelligence quotients were obtained from the CTMM-S-Form.

Statistical procedures were programmed for use on the IBM 7040 with the cooperation of the personnel of the Division of Educational Research at the University of Alberta. Responses on the SPLUT and SPPT were treated statistically with consideration given to the variables of grade, chronological age, intelligence, and reading vocabulary and comprehension achievement.

The relationship between the subjects' scores on the tests of Spatial Prepositions Listening Understanding and Spatial Preposition Paraphrasing and the variables listed above were considered by computing and examining the correlation coefficients between the scores and variables.

A one way analysis of variance was used to compare the scores of the grade two students with those of the three and four students on both SPLUT and SPPT. T-tests were used to determine if students at each of these grade levels differed in their performance on each of these tests.

To determine whether there was any significant





interaction due to sex and grade, a two way analysis of variance was carried out.

The responses on the sentence completion and story completion tests were analysed descriptively. The criteria on which this analysis was made are given in Chapter V.

### Summary

This chapter contained a description of the tests used in this study which involved sixty students in grades two, three and four in St. Albert School District #6.

A rationale for each type of test was provided and the testing procedure for each of the prepositions tests was described.

Included in this chapter was a description of the Pilot Study which was carried out in February, 1971.

The chapter concluded with a brief outline of the statistical measures used to analyse the data together with a brief description of the manner in which the two spatial prepositions tests which made use of "cloze" procedure were descriptively analyzed.



## CHAPTER IV

### ANALYSES OF DATA AND FINDINGS OF THE STUDY

The analyses of data and findings of this study concerning the tests of Spatial Prepositions Listening Understanding (SPLUT) and Spatial Prepositions Paraphrasing (SPPT) are presented in this chapter.

Section I is concerned with comparisons between the children's performance on the different tests at each level.

Section II deals with the differences which were found between the three grades on the spatial prepositions tests of listening understanding and reading, and the interaction between grade and sex on these tests.

Section III considers the relationship of the variables, age, intelligence and reading ability to the scores on SPLUT and SPPT.

#### I. Comparison Between Scores on the tests of SPLUT AND SPPT by Grade Level

Examination of the mean scores (see Table 4) for the test of listening understanding shows that grade two children are able to demonstrate their listening understanding of almost ninety-five per cent of the twenty spatial prepositions presented.

However, when the mean scores of the Spatial Prepositions Listening Understanding Test are compared with those of the Spatial Prepositions Paraphrase Test it can be seen that the same children's reading understanding of



TABLE 4

## PERFORMANCE ON SPLUT AND SPPT BY GRADE

Grade	Spatial Prepositions Listening Understanding		Spatial Prepositions Paraphrasing		Difference of Test Means	T-values	P
	Mean Scores 20/20	Standard Deviation	Mean Scores 20/20	Standard Deviation	SPLU and SPPU		
2 (n=20)	18.85	.91	14.80	2.96	4.05	5.774	.000
3 (n=20)	19.50	.74	16.75	2.68	2.75	4.115	.001
4 (n=20)	19.75	.77	17.70	1.58	2.05	5.119	.000





prepositions is almost twenty per cent lower. This would suggest that the grade two children's understanding of spatial prepositions in reading is not as well developed as their listening understanding.

Correlated t-tests were used to determine if there was any significant difference between those same twenty prepositions tested in two different modes (listening and reading).<sup>\*</sup> Results indicated that for grade two pupils, the difference between means was significantly different from zero.

#### Comparison Between SPLUT and SPPT for Grade Three

The mean scores of the two tests show that grade three students' understanding of spatial prepositions through listening is approximately fourteen per cent higher than their reading understanding (Table 4) of those same prepositions. Whilst this difference is not as great as that shown by the grade two children it is still statistically significant ( $p < .01$ ). The variation of scores around the mean was less on the test of Spatial Prepositions Listening Understanding than on that of the test of Spatial Prepositions Paraphrasing. The mean score shows that grade three children understood approximately ninety-eight per cent of the twenty prepositions in a listening situation. This is three per cent greater than the listening understanding of these prepositions shown by the grade two children.

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<sup>\*</sup> See Appendix C for raw score distribution on each test.



### Comparison Between SPLUT and SPPT for Grade Four

The listening understanding of spatial prepositions of the grade four children was also shown to be greater than their reading understanding of those prepositions. However, the difference between test means was not as great as the difference shown at both the grade two and three level. The variation around the mean for the listening understanding test was less than that around the mean for the sentence paraphrase test (reading). However, the variation around the mean for the latter test was less at the grade four level than at any other grade. It appears that as children advance through the grades, not only does the difference between their scores on the listening understanding and reading understanding of spatial prepositions decrease, but also they tend to become more homogeneous in their performance (as evidenced by the cluster of scores around the means). Nevertheless, the difference between the scores of the two tests at the grade four level reached significance at the .01 level of confidence.

### II. Comparison Among Grades Two, Three and Four on SPLUT

The mean scores on SPLUT show that listening understanding of spatial prepositions increases as children progress through school (Table 4). Whilst the grade two children showed that they understood most of the prepositions presented orally, the grade three and four students showed increasingly greater understanding.



To determine whether this difference between grades on listening understanding of spatial prepositions reached the .01 level of significance, a one way analysis of variance was carried out. The results are shown in Table 5. According to the data of this table, children in the three grade levels tested differed significantly ( $p < .01$ ) on their performance on the Spatial Prepositions Test of Listening Understanding.

To determine between which grade levels the above noted difference occurred, a Scheffé multiple comparison of means was made. Data are reported in Table 6.

The difference between the mean scores on SPLUT for grades two and four reached significance at the .01 level while the difference between the mean scores on SPLUT for grades two and three was statistically significant at the .05 level of confidence. Differences in performance at grades three and four did not reach significance. This would suggest that although there is a progression in listening understanding of spatial prepositions through the grades progression becomes less as school experience increases.

#### Comparison Among Grades Two, Three and Four on SPPT.

An analysis of the data of Table 5 also shows that grades two, three, and four differed significantly ( $p < .01$ ) between scores on the Spatial Prepositions Paraphrase Test (i.e. their reading understanding of these prepositions).

Although a difference was noted between the mean scores of grade two and three children on SPPT (Table 4) a





TABLE 5

## ANALYSIS OF VARIANCE: DIFFERENCES IN GRADE ON SPLUT AND SPPT

Source of Variance and Sums of Squares		Mean Squares		df		F	P
Test	Among Means of Grades	Within Grades	Among Means of Grades	Within Grades	Among Means of Grades		
SPLU	8.63	39.30	4.32	0.69	2	6.25	.01
SPP	87.42	369.2	43.71	6.48	2	6.75	.01



TABLE 6

COMPARISON OF SPLUT AND SPPT AMONG THE GRADES  
A SCHEFFE MULTIPLE COMPARISON OF MEANS

TESTS	GRADES		
	2-3	2-4	3-4
Spatial Prepositions Listening Understanding	.05	.01	-
Spatial Prepositions Paraphrasing	-	.01	-

- not significantly different at the .01 level  
.01 significantly different at the .0 level.

Scheffe multiple comparison of means (Table 6) indicates that this difference was not found to be statistically significant. The difference between mean scores on SPPT of grade three and four children also failed to reach a level of statistical significance. Between the mean scores of grade two and four students on SPPT however, the difference was found to reach the .01 level of statistical significance. It would, therefore, appear that the reading understanding of spatial prepositions, like that of listening understanding, increases as a child progresses through the grades. The difference for the former, however, appears to be less than



that for the latter. This conclusion is based on the data that whilst a difference at the .05 level of significance appears between grades two and three for the Listening Understanding of Spatial Prepositions no such difference occurs between these grade levels for the test of reading understanding.

#### Interaction Between Sex and Grade on SPLUT

According to the data of Table 7 sex did not show a main effect on the performance on the test of listening understanding of spatial prepositions. There was also no interaction between grade and sex. Grade appears to be the important factor in determining the responses on this test of spatial prepositions.

#### Interaction Between Sex and Grade on SPPT

Similar to the data for the test of listening understanding, the data of Table 8 show that the sex of the student did not affect his performance on the test of reading understanding of spatial prepositions. Although there was also a main effect due to grade on this test, there was also a significant interaction between grade and sex.

According to the observed means (Table 9), this interaction is due to the boys' scores being higher than those of the girls at the grade two level, while at the other two grade levels, the girls scored higher than the boys.





TABLE 7  
INTERACTION BETWEEN GRADE AND SEX ON SPLUT

Source of Variance	Sums of Squares	Mean Squares	df	F	P
Sex	.26	.26	1	0.37	ns
Grade	8.63	4.31	2	6.13	.01
Sex-Grade Interaction	1.03	.51	2	0.73	ns
Error	38.00	.70	54		

TABLE 8  
INTERACTION BETWEEN GRADE AND SEX ON SPPT

Source of Variance	Sums of Squares	Mean Squares	df	F	P
Sex	6.01	6.01	1	1.08	ns
Grade	87.43	43.71	2	7.90	.01
Sex-Grade Interaction	64.43	32.21	2	5.82	.01
Error	298.7	5.53	54		



TABLE 9

MEAN SCORES OF BOYS AND GIRLS ON THE SPATIAL  
PREPOSITIONS PARAPHRASING TEST

	Boys	Girls
Grade two	15.90	13.70
Grade three	15.40	18.09
Grade four	17.00	18.39

III. The Relationship of Age, Reading Ability and I.Q.  
to Spatial Prepositions Listening Understanding

At no one grade level were the predictor variables: age, total intelligence quotient, non-language intelligence quotient, vocabulary and comprehension found to be of value in predicting children's scores on the listening understanding test. No correlation of any statistical significance was found between these variables and listening understanding (Table 10). The language I.Q. correlated with performance on the SPLUT at the .05 level of significance for grade two pupils. However, when the sample as a whole was considered age was noted to be related to the test scores on the SPLUT at the .01 level of significance. This would mean that whilst it is difficult to predict scores on the SPLUT on the basis of age at any one grade level it can nevertheless be expected that the older a child is the more likely his scores will increase.



TABLE 10

## CORRELATIONS OF VARIABLES AND SPATIAL PREPOSITIONS LISTENING UNDERSTANDING

Subjects by Grades	Sex with SPLU	Age with SPLU	Total I.Q. with SPLU	Lang. I.Q. with SPLU	Non-lang I.Q. with SPLU	Reading (V) with SPLU	ACHIEVEMENT (C) with SPLU
2 (N=20)	.05	.18	.33	.50*	.10	-0.26	.08
3 (N=20)	.0	.19	-0.35	-0.18	0.11	-0.22	-0.09
4 (N=20)	-0.31	.02	-0.07	-0.12	-0.02	.17	-0.18
Total Sample (a) (N=60)	-0.07	.42**	.02	.20	-0.04	-0.30*	.16

(a) Total grade correlation .40 with SPLU significant at .01 level

\* Significant beyond .05 level

\*\* Significant beyond .01 level





TABLE 11

## CORRELATIONS OF VARIABLES AND SPATIAL PREPOSITIONS PARAPHRASING

Subjects by Grades	Sex with SPP	Age with SPP	Total I.Q. with SPP	Lang. I.Q. with SPP	Non-lang I.Q. with SPP	Reading (V) with SPP	Achievement (C) with SPP
2 (N=20)	-0.35	-0.14	.59**	.60**	.52*	.48*	.55**
3 (N=20)	.48*	.15	.67**	.59**	.36	.38	.31
4 (N=20)	.42	-0.33	.61**	.54**	.51*	.33	.19
Total Sample (a) (N=60)	.11	.39**	.52**	.57**	.34**	-0.07	.43**

(a) Total grade correlation .42 with SPP significant at .01 level

\* Significant beyond .05 level

\*\* Significant beyond .01 level



A negative statistically significant relationship was noted between performance on the vocabulary test and SPLUT when the total sample was considered.

The reason for this negative correlation may have been in part the result of the difference between the nature or format of the two tests involved.

The vocabulary test a) required selection of a synonym for a key word from a list of four or five words (pictures were provided in place of key words at the grade two and part of grade three level), and, b) consisted of words which increased in difficulty throughout the grades. On the listening understanding test words were presented in context in the presence of objects and also the words selected for use in the SPLUT were chosen for their aural familiarity to the children at all grade levels. Consequently although the grade four students would be challenged by the vocabulary test at their grade level, they would be expected to do very well on the SPLUT. It would seem than the negative correlation observed may have been influenced by these factors.

#### The Relationship of Age, I.Q. and Reading Ability to Spatial Preposition Paraphrasing (Table 11)

For the grade two, three and four students total and language I.Q. scores correlated significantly at the .01 level with scores on the Spatial Prepositions Paraphrasing Test. This suggests that these variables are the best predictors of the reading understanding of these prepositions



at all grade levels tested.

At the grade two and four levels a statistically significant relationship ( $p < .05$ ) between language I.Q. and the prepositions test was also noted. Reading vocabulary and reading comprehension correlated significantly with the reading understanding of the spatial prepositions at the grade two level only. This suggests that both tests appear to be measuring similar factors for these children. It also suggests that the test of spatial prepositions paraphrasing was possibly too easy for the grade three and four students and no significant correlations occurred because of the narrow range of scores. Sex at the grade three level correlated at the .05 level with SPPT.

As far as the total sample was concerned statistically significant relationships at the .01 level were found between SPPT and age, total, language and non-language I.Q. and reading comprehension.

Vocabulary and sex were the only variables which were not significantly related to performance on the reading understanding of spatial prepositions test when scores for the total group were analysed.

#### SUMMARY

Children in grades two, three and four showed that their listening understanding of spatial prepositions was greater than their reading understanding of these same prepositions. At each grade level tested the difference





reached the .01 level of significance. It was noted that with increase in grade level the difference between the scores on the two tests decreased which suggests that children in grade four can be expected to have better understanding, both through listening and reading, of spatial prepositions than children in the lower grades.

Only one significant relationship ( $p < .05$ ) occurred between performance on the test of listening understanding and selected variables. The relationship indicated above was found between language I.Q. and listening understanding of prepositions at the grade two level. One reason for the low correlation between the selected variables and scores on this test could have been due to the high scores generally obtained on the prepositions test and consequently the slight spread of scores.

I.Q. (total, language, non-language) appeared to be the best predictor of scores on the test of reading understanding at each grade level tested. Both reading vocabulary and reading comprehension correlated significantly with the reading understanding prepositions test at the grade two level only. Lack of significant correlations between these variables at the grade three and four levels may be partly explained by the fact that the reading understanding prepositions test was fairly easy for pupils at these grade levels because of the controlled vocabulary.



## CHAPTER V

### THE DESCRIPTIVE ANALYSIS OF THE RESPONSES ON THE SPATIAL PREPOSITIONS SENTENCE AND STORY COMPLETION TESTS

One of the difficulties faced in investigating children's understanding of prepositions is the nature of the prepositions themselves. Although labelled as such, their role in language changes according to the context in which they are placed. They can, therefore, be used adverbially, in conjunction with adverbs, or simply as prepositions. The sentences, Put it underneath the table, put it underneath, and, the dog underneath the table, show the different functions of the prepositions. In the first the word underneath is largely adverbial, in the second it is wholly adverbial, and in the third it is entirely prepositional (Classen, 1919). According to Curme, (1935), the preposition does not function singly but forms a grammatical unit with its objects - that is the word or words following it.

The preposition tends to express the nature of the relationship, in time or space, between two things rather than the relationship between a thing and an action.

Children's understanding of prepositions is therefore largely dependent upon their knowledge of the many situations, contexts and structures, in which those prepositions are found. For this reason a descriptive analysis of the responses made on the reading tests of spatial prepositions



understanding which utilized "cloze" procedure, that is the Sentence Completion and Story Completion Tests, has been organized according to certain criteria.

The first of the criteria chosen was based upon the results of the Spatial Prepositions Paraphrase Test (SPPT) which was analyzed statistically in Chapter Four. It was noted that certain prepositions caused more difficulty than others at all grade levels on this test of reading understanding. It was decided that information concerning the performance on those same prepositions on the Sentence Completion Test would be of interest since the manner of presenting them differed both in form (i.e. "cloze" procedure) and context.

It was also noted that the children in all grades found some prepositions easier to understand than others. A second category based on the prepositions which the children found to be the easiest on SPPT was used as a criterion for analysing responses on the sentence completion test.

Examination of the responses made on the Spatial Prepositions Sentence Completion Test revealed that the children made a variety of responses for each preposition. For this reason a category which took into account the number of different responses given per preposition on the sentence completion test was included in this chapter.

It was found that the variety of responses given per preposition could be divided into two groups - acceptable





and non-acceptable. The acceptable responses could be further subdivided into prepositional synonyms, prepositional antonyms, and other words and prepositions.

The nature of the words substituted for the prepositions therefore, formed another category. The consistency of certain prepositional synonyms given as responses (which may indicate a preferred use of certain prepositions by the children tested) was also investigated.

As has been noted in Chapter Two spatial prepositions are the means whereby the ideas of spatial relationship are communicated. However, those spatial prepositions can themselves be grouped to show specific spatial relationships. Leech (1969) groups locative words under two major headings. Static Location and Movement and Destination. Those prepositions which are used to indicate position without movement are placed in the former category whilst those which denote movement through space are placed in the latter.

As the fifth criterion for analysing the children's responses Leech's categories are used.

As was noted in Chapter Three (p.55) Smith (1963) points out that the structural arrangement of words in a sentence, the organization of a group of sentences and the context in which the words are embedded are all significant contributors to the understanding of reading.

Since the understanding of the prepositions used in this study was dependent upon those features mentioned by Smith above, analysis of children's responses was also



carried out using specific semantic context as a criterion.

In summary, the descriptive analysis of the responses made by the children in this study on the Spatial Prepositions Sentence Completion Test was based on the following criteria:

1. The five most difficult spatial prepositions on the test of Spatial Prepositions Paraphrasing and the extent of their use on the Spatial Prepositions Sentence Completion Test.
2. The six easiest spatial prepositions on the test of Spatial Prepositions Paraphrasing and the extent of their use on the Spatial Prepositions Sentence Completion Test.
3. The number of different responses per preposition.
4. The nature of the words substituted per preposition (prepositional synonyms, prepositional antonyms, other words and prepositions).
5. Consistency of responses of specific prepositional synonyms.
6. Static location or movement and destination.

The responses on the Spatial Prepositions Story Completion Test were analyzed according to the effect of context on the insertion of the various prepositions. Since the understanding of a paragraph or a story requires the holding in abeyance of different contextual relationships this criterion of contextual congruity was used. That is, the consistency with which the context within the story



was borne in mind as opposed to the context of the immediate sentence in which the prepositions were found, was investigated.

The Five Most Difficult Spatial Prepositions on the Test of Spatial Paraphrasing and the Extent of Their Use on the Test of Spatial Prepositions Sentence Completion.

The five most difficult prepositions on SPPT were around, above, in front of, behind and on the right (Table 12) The items containing these five prepositions on the Sentence Completion Test were analysed to determine how frequently these prepositions were given as responses. The results are tabulated in Table Twelve. (It must be noted that even though the children did not respond with the required prepositions for some items they gave acceptable responses in the form of synonyms or other words by means of which the semantic content of the sentence was preserved). In comparing the mean difficulty of these prepositions with the responses made on the sentence completion test it can be seen that the grade two students found the prepositions around, and behind to be about as difficult on both tests. They found above, in front of, and, on the right, much more difficult on the sentence completion test than on the paraphrasing test.

The grade three students also found the prepositions around, above and behind to be of similar difficulty on both tests and although they found on the right less difficult than the grade two children on the sentence completion test, they nonetheless found it a more difficult task on the sentence completion test than on the paraphrase test. No child in





TABLE 12

MEAN SCORE OF THE FIVE MOST DIFFICULT PREPOSITIONS  
(AS INDICATED BY THE PARAPHRASE TEST) AND  
NUMBER OF ACCEPTABLE RESPONSES ON THE  
SENTENCE COMPLETION TEST

Spatial Prepositions	Mean Diffi- culty on SPP	Grade					
		II		III		IV	
		D	A	D	A	D	A
around	12	12	12	14	14	15	15
above	12	5	9	14	16	2	6
in front of	13	0	0	0	0	0	1
behind	14	14	14	16	16	14	14
on the right	14	2	3	8	8	6	7

D - Difficult prepositions on the sentence completion test.  
A - Acceptable responses in place of required preposition.

grade three was able to supply in front of, or a suitable alternative, in the sentence completion test.

At the grade four level around and behind proved to be of similar difficulty on both tests. Above was a preposition which only four children used on the sentence completion test. As with the grade two and three students no student in grade four used in front of in the sentence completion test. Thus in terms of the sentence completion test in front of proved to be the most difficult item for all grades.



The Six Easiest Spatial Prepositions on the Test of Spatial Prepositions Paraphrasing and the Extent of Their Use on the Test of Spatial Prepositions Sentence Completion

There were three groups of prepositions on the paraphrasing test which were found to be easier than the rest. They were (in order of least difficulty) on top of, and beneath; through, and over; and inside, and underneath.

Table 13 shows that few children at the grade two level used on top of to complete the item on the sentence completion test. Since no other response was acceptable it would appear that in terms of the sentence completion item the grade two children did not find on top of as easy on this test as they did on that of the paraphrasing.

Beneath was not given as a response, nor was underneath. However, other acceptable responses were given in their place.

Use of through and over for which there were no other acceptable responses was not excessive. Whereas the mean score for these prepositions on the paraphrase test was nineteen, the mean score for the insertion of these prepositions on the sentence completion test was thirteen and ten, respectively. This suggests that the children did not find them as easy on the sentence completion test as they did on the paraphrasing.

Inside was only used by one child in grade two. However, a number of children used other acceptable prepositions.

The responses of grade three and four pupils tended to be more similar than the responses of pupils at either



of these grade levels and the responses of grade two pupils.

TABLE 13

MEAN SCORE OF THE SIX EASIEST PREPOSITIONS  
(AS INDICATED ON THE PARAPHRASE TEST) AND  
NUMBER OF ACCEPTABLE RESPONSES ON THE  
SENTENCE COMPLETION TEST

Spatial Prepositions	Mean Diffi- culty on SPP	Grade					
		II		III		IV	
		E	A	E	A	E	A
on top of	20	2	2	2	2	6	7
beneath	20	0	7	0	7	0	10
through	19	11	11	13	13	13	13
over	19	5	5	10	10	15	15
inside	18	1	3	0	2	0	3
underneath	18	0	3	0	5	0	4

E - Easiest prepositions on the sentence completion test.  
A - Acceptable responses in place of required prepositions.

#### The Number of Different Responses per Preposition (Table 14)

The average number of total responses made by the grade two children on the Spatial Prepositions Sentence Completion Test was greater than that of either the grade three or four students (See Figure 1). However, when the total average response of each grade is compared with the average acceptable response it can be seen that it is the





grade four students whose average is the highest. This suggests that whilst the grade two students made more responses than the grade three or four students they were less accurate in their choice of words for sentence completion purposes.

The prepositions which drew the greatest number of responses at the grade two, three and four levels were; on the left, in front of, and on top of. The grade two students also gave a large number of different responses to above, below and on the right, whilst the grade three students gave a large number of different responses to on the right, near, underneath and beneath. The grade four students responses appeared to be more similar to those of grade three students than of grade two students. The lowest number of different responses were given for the prepositions on, beside, behind, and between by the grade two students, for on, inside, over, out, and across by the grade three students, and for on, beside, inside, behind and outside by the grade four students. Thus, there appeared to be greater diversity between grades on those prepositions to which fewest responses were made as compared with those prepositions which evoked the greatest number of responses.

The highest number of acceptable responses were given for beneath, above, beside and underneath for all of the grades in this study. The grade two and four students also gave a large number of responses to inside.

No acceptable responses were given for in front of, at the grade two level, for across at the grade two and



three level, and for on the left at the grade four level.

It would appear that the children in these grades have not yet fully understood the spatial concept of these prepositions when they are presented in the particular sentence context of the sentence completion test.

The Nature of the Words Substituted Per Preposition:  
Prepositional Synonyms and Antonyms and Other Words  
and Prepositions

The responses given on the test of Spatial Prepositions Sentence Completion were considered to be acceptable or unacceptable according to whether they were plausible in terms of grammatical structure and semantic content. However, these responses were found to fall under three headings, prepositional synonyms, antonyms, and other words and prepositions.

Prepositional Synonyms (Table 15)

Synonyms for above, beside, inside, outside and, on the right were given by children in all the grades. Following the order listed above the children substituted, over, by, in, into (for inside), out, and at the right.

For on top of, a number of children at all grade levels substituted, on, up on, up on his, on the high, up on top, on a chair, high up on and up behind. Whilst these phrases were not acceptable for purposes of sentence completion they do demonstrate that many children were aware of the spatial implications. This would appear also to support the conclusion that there is a lag between their understanding of the concept and their ability to supply a verbal label.



ALTERNATE AND ACCEPTABLE RESPONSES FOR ITEMS ON SPSC  
BY GRADE

Spatial prepositions		Grades					
		II		III		IV	
		Sentence Completion					
		T	A	T	A	T	A
1.	Over	6	1	2	1	5	1
2.	Out	5	1	2	1	5	1
3.	Between	4	1	5	1	5	1
4.	Above	9	5	5	3	6	5
5.	Beside	4	4	4	3	3	3
6.	Around	5	1	4	1	6	1
7.	Underneath	5	3	7	5	5	4
8.	Inside	5	3	2	2	3	3
9.	Behind	4	1	4	1	3	1
10.	On	1	1	1	1	1	1
11.	Across	5	0	3	0	4	1
12.	On top of	10	1	6	1	9	2
13.	Near	7	1	10	1	9	1
14.	In front of	11	0	7	2	14	1
15.	Through	7	1	5	1	4	1
16.	Outside	8	2	5	2	3	2
17.	Beneath	7	7	7	7	10	10
18.	On the left	12	1	7	2	14	0
19.	Below	9	1	4	1	8	1
20	On the right	9	2	6	1	7	2

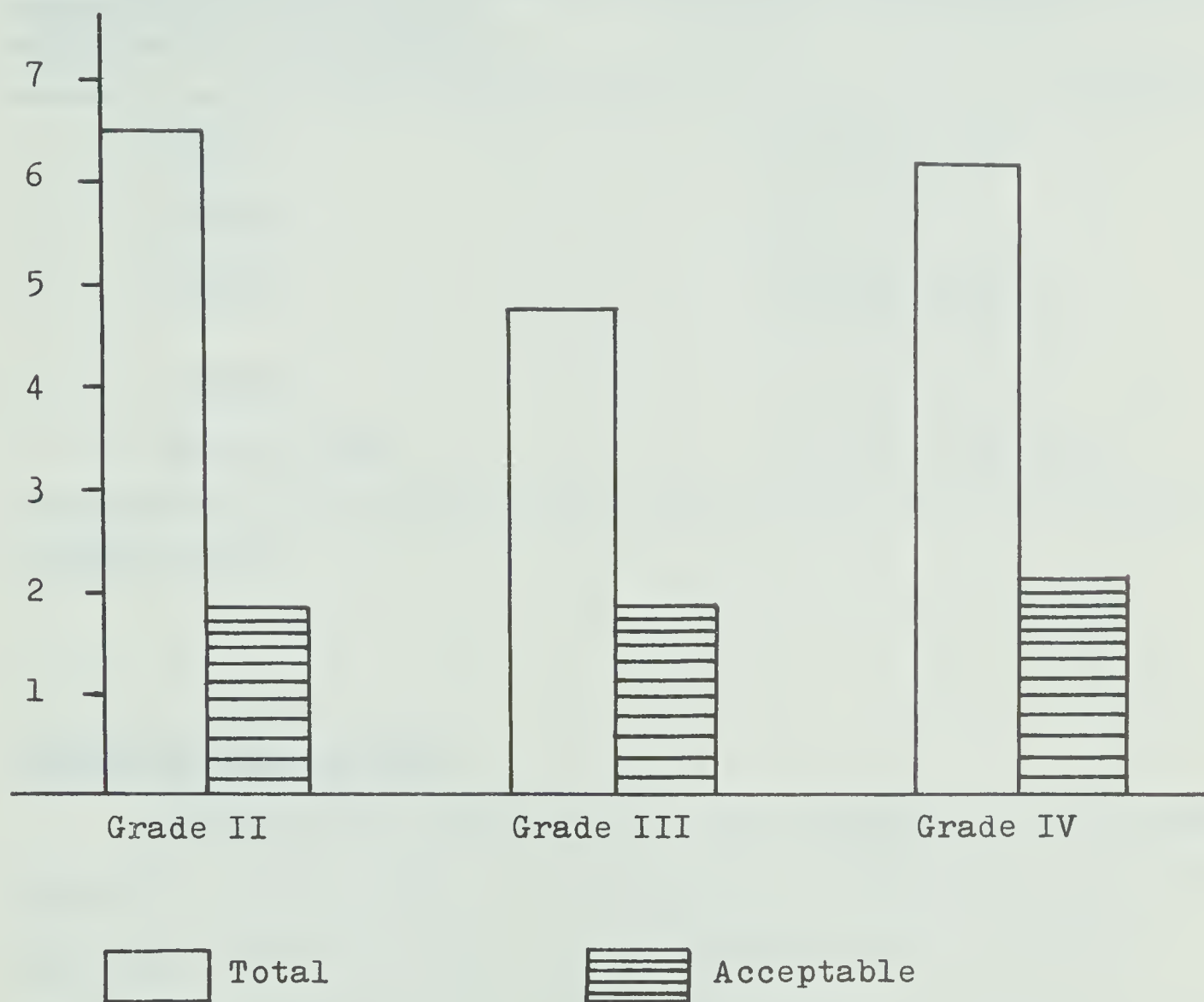
T= Total different responses

A= Acceptable responses





FIGURE 1



Average Number of Total Responses and  
Acceptable Responses by Grade on the  
Sentence Completion Test



TABLE 15

## PREPOSITIONS FOR WHICH SYNONYMS WERE GIVEN CONSISTENTLY

Prepositions for which synonyms were substituted	Synonyms substituted
above	over (2, 4)*
beside	by (2,3)
inside	in (2, 3, 4) into (2, 3, 4)
outside	out (2, 3, 4)
on the right	at the right (2)

\* Grade level

Prepositional Antonyms

Antonyms were supplied by a few children at each grade level for on the right. On the left, to the left, and, left hand side were all given, suggesting that some confusion still exists between the concepts of on the right and on the left. No child, however, substituted on the right for the item containing on the left. Since the on the right item required the child to orient himself in terms of two other people, i.e. Ted and Mother (since Ted was holding Mother's right hand) the task may have been more complex than that required by the on the left item.



Other Words and Prepositions

Falling into the non-synonymous category were responses for sentences that were intended to include near, out, between, around, behind, across, on top of, through, on the left, and below. The item for in front of, evoked responses that were plausible in terms of sentence completion even though they were not synonymous with that phrase. Some grade two students, for example, attempted to complete sentences by using the following words, a big boy, right up to, his sister and, the girl and, his best friend, and, a boy named. Most of these could be considered acceptable to complete Dick pushed — — — Ted in the line-up. The grade three students substituted, to get with, his best friend, his friend beside, and, Bob, Bill and, to complete the same item. It can be seen that some of these responses are similar to those of the grade two children. The child who responded, his friend beside, was demonstrating knowledge of a spatial concept even though the total resulting sentence is weak in terms of meaning.

One grade three child although failing to respond with in front of demonstrated that he had some understanding of the concept by his insertion of, out of the. Whilst this is not acceptable in terms of sentence completion the idea of taking the place of another child in a line-up through pushing was understood.

It can be seen through responses of this sort that, whilst no generalizations can be made on the basis of one or





two children's responses, the kinds of difficulties demonstrated here are likely to be common to the children in these grades who have not yet mastered spatial concepts to a degree where they can fit the right verbal label to suit the situation.

Grade four students showed greater variety of spatial words in their responses to the in front of item. They used phrases such as the person behind, near his friend, through to see, and Paul right over. They also used a number of phrases which are similar to those given by the grade two and three children.

#### Consistency of Responses of Specific Prepositional Synonyms

Investigation of the responses given on the sentence completion test shows that certain prepositions appear to be less used than others. For the preposition beneath, the students in all grades consistently gave different acceptable responses. This suggests that the confusion noted in the test of Listening Understanding of Spatial Prepositions on the item containing beneath is consistent with the failure to use it as a response on either of the sentence or story completion tests and that perhaps failure to understand beneath in a listening situation is the result of the fact that it is not commonly used in general conversation by adults. Underneath would appear to be becoming archaic since under is always used instead. In the same way, outside and inside seem to be less well used than either out or in. Although it may well be that the children in this



sample are not familiar with the subtle shades of meaning which make the difference between in and inside it would appear that there is a difference between their oral use of these prepositions and writers' use of prepositions in print. The precise meaning of prepositions seems to be declining as far as some of the prepositions used in this study are concerned. Beneath in particular seems to be a literary term that children do not meet in their social discourse. To the left or right of as compared with on the left or right of does not appear to be a precise distinction known to the children in these grades. This may be indicative of the trend for adults who tend not to differentiate between the two.

#### The Grouping of Prepositions According to their Function in Terms of Static Location or Movement and Destination.

As has been stated earlier in this chapter, spatial prepositions can be classified according to two major categories: Static location if they do not represent movement, and movement and destination if they do. Subsumed under static location are further categories such as proximity, vertical and horizontal relations, extremities, and position and dimensionality. Performance on prepositions grouped according to these categories is discussed below.

#### Proximity

The understanding of prepositions denoting proximity namely, beside, inside and outside although demonstrated through use of synonyms appears to increase slightly through



the grades. Near, which also denotes proximity was less well understood at all grade levels. Within the context of the item concerned no alternative was acceptable. Since beside and near are similar in meaning it is interesting to note that few children chose to use near in the beside item but chose to use other acceptable prepositions (although not synonymous) to make completion. Many children at all grade levels substituted on for beside, thus:

Billy made his dog sit on his bike

Perhaps this is an indication that neither beside nor near are well understood by children in grades two, three and four. This could perhaps be the result of the lack of specific location denoted by these two words. At what point is beside, beside an object and at what point is near, near? For children, therefore, prepositions denoting proximity would appear to be a source of difficulty in reading.

### Vertical and Horizontal Relations

Over, under, above, below, underneath, beneath, in front of, behind, on the left of, on the right of refer to the relative position of two objects.

Only half of the children in this sample used over to complete the item on the sentence completion test. Since no synonym was acceptable it would appear that over is likely to be a source of difficulty in reading for a number of children at these grade levels. Under, the converse of over, was found to be equally as difficult at the grade two level and more difficult than over, at the grades three and four







levels. Below was given as a response by a larger number of grade three students than either grade two or four. At the grade three level sixty per cent of the children responded with below for the item concerned. Since forty per cent of the grade two and thirty-five per cent of the grade four students answered the below item correctly it would appear that the understanding of grade two, three and four students is not yet fully developed as far as sentences of the nature of the below item are concerned. It is interesting to note that the grade three students also demonstrated greater use of above (the converse of below) than did either the grade two or four children.

Underneath and beneath were not used by the children in this sample.

In front of appears to be less well understood than behind by all of the children in this study. On the left of, and on the right of were both found to be extremely difficult responses to make with accuracy. The grade three students were considerably more successful than those in grade two or four with on the right because forty per cent of the grade threes compared with only fifteen per cent of grade twos and thirty per cent of the grade fours were able to respond correctly. Even so the concept of on the right seems to be a likely source of reading difficulty. On the left was again least difficult for the grade three students although the grade two, three and four responses that were correct only accounted for fifteen per cent of the responses.



### Extremities

On top of as a phrase does not appear to be in common use by grade two, three and four children. On, which is less particular in terms of position, seems to be better known.

### Position and Dimensionality

The prepositions which denote simple position, i.e. the relation between an object and a location are: across, through, and around (and where there are two objects, between).

Across was only used correctly by a few grade four students. Through proved to be better understood by all of the grades and the correct responses accounted for fifty-five per cent of the responses of grade two children, sixty-five per cent of the grade three, and sixty-five per cent of the grade four children. Around caused little difficulty for the children in this study since the majority used it as a response. Since between was not chosen as a response by many children at any grade level, and since no other response was considered acceptable, it is assumed that understanding of the concept between is limited.

### Movement and Destination

Prepositions used in connection with verbs of movement are those which according to Leech (1969) are contained within the above description.

Out (of) is such a preposition. Most children in this study were successful in demonstrating their reading understanding of this term.



### Specific Semantic Context

Certain prepositions were found to be particular to certain specific semantic contexts. Among these were the prepositions over, out, between, around, behind, on, across, near, through, and below. No other prepositions could replace these prepositions in the sentences where they were deleted.

The sentences which were to have contained above, beside, underneath, inside, outside, beneath, on the left, on the right, on top of, and in front of were of such content that other acceptable responses were possible.

For example, The sun can shine high over, on, through, in, among, or behind the clouds. The sun's activity is not limited in place as is that of a goldfish who can only swim around in his bowl. The children were aware of these differences for they made use of the many synonyms or acceptable responses in place of above. It is interesting to note that although over is synonymous with above, no child used above as a response to the item in which over was deleted (Ann looked — her shoulder at Mary). It was also possible to complete the sentence that was to have contained beside with a variety of responses including, by or near. On was also given by children at all grade levels. Whilst adults would hesitate to consider on as a feasible means of completion in terms of logic (one does not usually make a dog sit on a bicycle) the majority of children chose to use on as their preferred response. Whether this was because they saw no





difficulty in the task of making a dog sit on a bicycle or whether it is more linguistically familiar to say "sit on" instead of "sit beside" cannot be ascertained. However, two thirds of the children in the study thought that on was a plausible means of completion for beside. The verb to hide can be followed by a large number of prepositions such as under, near, beside, behind, on, in, and around. Within the specific context of the sentence which was meant to contain underneath, i.e. I found a frog hiding — a stone, the use of some prepositions is impossible in terms of meaning. It is impossible, therefore, for a frog to hide on a stone, or in a stone, but it can hide under a stone. A boy, on the other hand, could not hide under a stone but he could hide on an aeroplane. Whilst most children were aware of the differences between the plausibility of some prepositions within this context, a number of children were not. Some responded with in, around, and on, showing that they were not reading for contextual meaning. Although it is possible to hide around a corner, it is not possible for a frog to hide around a stone.

As was noted earlier beneath was a preposition that was not used. However, a variety of acceptable responses were made in its place. For the sentence: The spider crept — a pile of papers, the children substituted on, up, in, along, under, through, into, by, over, to, across, and around. In fact no child made an unacceptable response to this item although one child failed to respond at all. This shows that



certain specific semantic contexts will support a large number of alternate prepositions. Had the word spider been changed to girl for example, beneath, underneath, and along would have been unacceptable, likewise, had the verb crept been changed to jumped, a number of other substitutions would not have been possible. Grade two, three and four children then, generally appear to be aware of those instances where some prepositions are plausible and where some are not because of the specific semantic contexts in which the prepositions are placed.

### Contextual Congruity

On the test of Spatial Prepositions Story Completion a number of children whilst making acceptable responses in terms of specific sentence context were inaccurate in terms of the overall story context. Errors which fell into this category included prepositions in items 4, 10, 12, and 18. Table 16 shows the number of students who gave acceptable responses for the individual sentences and the number of students who gave acceptable responses in terms of the story context.

Item number 4 was: Clancy saw the farmer go (behind, around) the barn. A number of plausible responses could be made in terms of this sentence. However, the child who was able to hold this idea in mind until he had read the next but one sentence was the one who would be able to reject in, into, and inside the barn because the next but one sentence said, Then he came around on the (left, right, other



side) of the barn. Very few children managed this task at any grade level.

Item number 10 stated: He could see the hay loft (over, above) the barn door. A great many children failed to note the spatial implications within this sentence for a hay loft is "aloft" meaning "on high". For this reason unless the child read further to see that Clancy climbed the ladder up to the hay loft he was likely to respond with in, by beside or to instead of over or above. It is interesting to note that the only grade two child who responded up above for item 10 failed to respond below for item 12. The child who responded below to item 12 failed to respond accurately for item 10 because beside was given instead of above.

Item Number 12 also depended upon this idea for in order for Clancy to see the cows below, beneath or underneath him the child had to realize what Clancy's position was in relation to the ground. Around and beside were some of the inaccurate responses given by all grades.

Item number 18 required the child to hold in mind the events at the beginning of the story. Since the pig was concerned as to the content of the box from the beginning of the story and was up in the hay loft to find something with which to open the box the only feasible response to "— was a baby chick" was inside. Few children were able to respond acceptably because they appeared not to have read the story with complete understanding of the many relationships involved.







TABLE 16

NUMBER OF ACCEPTABLE RESPONSES TO SELECTED SPATIAL  
PREPOSITIONS ON THE STORY COMPLETION TEST

Acceptable responses in Terms of Sentences in Isolation				Acceptable Responses in Terms of Story Context		
Item Number	Grade			Grade		
	II	III	IV	II	III	IV
4	20	20	20	0	1	0
10	1	0	2	1	0	2
12	1	4	4	1	2	1
18	16	20	19	0	2	3

### Summary

Descriptive analysis of the responses given on the Spatial Prepositions Sentence Completion Test showed that the five most difficult and six easiest prepositions (as determined by the paraphrase test) were even more difficult when the pupils were required to complete sentences using these prepositions. This would seem to indicate that the task of using these prepositions is more difficult when the reading situation is less structured.

On the Paraphrase Test the students had to select from three sentences, the one that had the same meaning as the introductory sentence (in other words, the answer was given),



whereas in the Sentence Completion Test, the pupils had to select a preposition based on their experience only.

Grade threes and fours generally did better than grade two students on the Sentence Completion Test.

Although grade two students tended to give more responses than pupils in the other two grades to the various prepositions, the grade four pupils usually gave a greater number of acceptable responses thus indicating greater linguistic control of the meaning of these prepositions.

Alternative responses given in lieu of the required prepositions fell into three categories: Synonyms, antonyms, and other words which were used for sentence completion purposes. The use of synonyms would indicate a command of the use of these prepositions, whilst the use of various words which though similar to the meaning of the preposition deleted (though not semantically acceptable) would seem to indicate that there may be stages of refinement in the acquisition of the concepts underlying these prepositions. The verbal label (required to complete the sentences of the Sentence Completion Test) may be the final step in the stages of acquisition.

Consistent substitution of synonyms for such prepositions as beneath, underneath, inside, and outside may mean that these prepositions are being less used colloquially and consequently pupils are less familiar with their meaning.

Children's understanding of vertical and horizontal



relations is greatest at the grade four level. Position and dimensionality as represented by between, and proximity as represented by beside, appears to be difficult at all grade levels. Movement and destination (out) was found to be easy by all grades.

The semantic context in which a preposition is placed appears to influence the difficulty of the preposition. More specifically the objects, between which the preposition indicates a relation, tend to determine the specific choice of the preposition. Changing one of the objects would allow for a number of prepositions to be meaningfully inserted.

Analysis of the responses on the test of Spatial Prepositions Story Completion reveals that although it is possible for children to make closure for individual sentences, when those sentences are considered in terms of contextual congruity, many children fail to see the relationships of the sentences within the total story. The holding in mind of the different spatial concepts throughout the story appears to be a difficult task for children in grades two, three and four. The grade four and three children appear to be more successful than the grade two children in this task.





## CHAPTER VI

### SUMMARY, CONCLUSIONS AND IMPLICATIONS

Spatial prepositions occur with considerable frequency both in oral and written language because they are the means whereby position in space, of people and objects, is communicated. Whereas in isolation these words have relatively little meaning, within the context of a sentence or a story they show the relationship of not only an object with another object but the relationship of an object and an action.

Because spatial concepts themselves are abstract in nature those prepositions which are used as verbal labels for those concepts cannot be understood unless the spatial concepts themselves have been internalized by the listener or the reader.

Elementary school children spend most of their days in school listening and reading. If they are to learn and benefit from this listening and reading they must be able to understand a wide range of concepts through verbal labels. The purpose of this study was, therefore, to investigate children's listening and reading understanding of spatial concepts represented through spoken and written spatial prepositions.

The four sections of the chapter will present a brief summary of the study, the findings and conclusions, suggestions for further research, and educational implications arising from the study.



## I. SUMMARY OF THE STUDY

The purpose of this study was to investigate the listening and reading understanding of spatial prepositions of children in grades two, three and four. In order to test this understanding four tests were devised. They included one test of listening understanding and three tests of reading understanding of spatial prepositions. One of the reading tests involved the use of a deep structure recovery technique whilst the other two involved the use of "cloze" procedure.

These tests together with tests of reading achievement and intelligence were administered to sixty students from the St. Albert School District #6. Ten boys and ten girls from each of grades two, three and four were tested.

The data obtained from the test of Spatial Prepositions Listening Understanding and the test of Spatial Prepositions Paraphrasing were processed by a number of statistical techniques which included the computation of correlations coefficients, one way analysis of variance, two way analysis of variance and t-tests. Variables considered in this study were age, grade, sex, intelligence and reading achievement. The Spatial Prepositions Sentence Completions Test and Story Completion Test were submitted to a descriptive analysis.

## II. FINDINGS AND CONCLUSIONS

The null hypotheses stated in Chapter I are restated below and data for and against the statement of each hypothesis are explained.



Null Hypothesis 1

There is no significant difference between the scores on a test of listening understanding of spatial prepositions and scores on tests of reading understanding of those prepositions for each of:

- a) grade two
- b) grade three
- c) grade four

To determine whether there was a difference between the scores on the test of listening understanding and the test of reading understanding of spatial prepositions for each of the grade levels tested the results of these tests were submitted to a t-test analysis.

- a) A significant difference (at the .01 level) was found between the scores on the test of Listening Understanding of Spatial Prepositions and the test of Spatial Prepositions Paraphrasing for the grade two students. Scores were higher on the test of listening understanding of prepositions.
- b) A significant difference (at the .01 level) was found between the scores of the same tests at the grade three level. Scores on the listening test were again higher.
- c) A significant difference (at the .01 level) was also found between the scores of these tests at the grade four level. As in the previous two grades, pupils at this level also made higher





scores on the test of listening understanding than on the test of reading understanding of the spatial prepositions investigated.

The difference noted between the test scores at all grade levels suggests that the reading comprehension of spatial prepositions is not as well developed as that of listening understanding.

It would, therefore, appear that the children in this study found it easier to demonstrate their understanding of spatial concepts when they are required to demonstrate their understanding of them in a listening situation and in the presence of concrete objects, than when they are required to demonstrate their understanding by reading them in the more abstract form of print.

Null Hypothesis 1 (a, b, and c) is, therefore, rejected since there is a significant difference between the scores on tests of listening and reading understanding of spatial prepositions for each of grades two, three and four.

#### Null Hypothesis 2

There is no significant difference between the scores of grades two, three and four pupils on their

- a) listening understanding of spatial prepositions and
- b) reading understanding of these prepositions.
- a) A one way analysis of variance was used to determine whether grades two, three and four students differed in their listening understanding



of spatial prepositions. The findings of this analysis revealed that children in the three grade levels differed significantly ( $p < .01$ ) on their performance on the test of Spatial Prepositions Listening Understanding. According to a Scheffé multiple comparison of means the greatest difference noted was between grades two and four ( $p < .01$ ). However, a statistically significant difference at the .05 level of confidence was noted between grades two and three.

It would appear that listening understanding of spatial prepositions increased gradually with age.

- b) A one way analysis of variance was also used to determine whether grades two, three and four students differed in their reading understanding of spatial prepositions. It was found that a significant difference (at the .01 level) was noted amongst the grades on the test of Spatial Prepositions Paraphrasing. A Scheffé multiple comparison of means revealed that the significant difference occurred between grades two and four.

It seems that reading comprehension of spatial prepositions like that of listening understanding, increases gradually with age. However, the difference for the former appears to be less than that for the latter for whilst a difference at the .05 level of significance appears between grades two and three, for the listening understanding of



spatial prepositions, no such difference occurs between these grade levels for the test of reading understanding.

Null hypothesis 2 (a and b) is rejected.

### Null Hypothesis 3

There is no significant correlation between listening understanding of spatial prepositions and

- a) chronological age
- b) reading ability
- c) intelligence
- a) When pupils' listening understanding scores were correlated with chronological age a statistically significant relationship at the .01 level was noted for the total group. When the same scores were correlated with chronological age on an individual grade basis no statistically significant relationship was found.

It would, therefore, be difficult to predict listening understanding of spatial prepositions on the basis of age at any one grade level although it appears that listening understanding of spatial prepositions does increase with age.

The (a) statement of the null hypothesis cannot be rejected completely.

- b) Reading ability (vocabulary and comprehension) failed to correlate at a level of statistical significance with the listening understanding scores of children in any of the grades tested.





However, when the total sample was considered a negative statistically significant relationship was noted between vocabulary and listening understanding of spatial prepositions.

The (b) statement of the null hypothesis is not, therefore, completely rejected.

- c) Intelligence quotients (total and non-language) failed to correlate with listening understanding of spatial prepositions either on an individual grade or total group basis. The language intelligence quotient, however, was found to correlate significantly at (the .05 level) with listening understanding of spatial prepositions at the grade two level.

Therefore, subsection (c) of null hypothesis 3 can be rejected only in part.

#### Null Hypothesis 4

There is no significant correlation between reading understanding of spatial prepositions and

- a) chronological age
  - b) reading ability
  - c) intelligence
- a) When pupils' paraphrasing scores were correlated with chronological age a statistically significant relationship at the .01 level was noted for the total group. No statistically significant relationship between these variables was found



for individual grades, however,

Prediction of reading understanding of spatial prepositions on the basis of age at any one grade level would be difficult. However, it does appear that reading understanding of prepositions increases with age.

The (a) statement of the null hypothesis cannot be rejected completely.

- b) Within grades, the only significant correlations found between reading ability and reading understanding of spatial prepositions occurred at the grade two level. At this level, reading (comprehension) ability correlated with reading understanding of spatial prepositions at the .01 level of significance. The relationship between reading (vocabulary) ability and the reading understanding of spatial prepositions was significant at the .05 level. The only other significant correlation between the above mentioned variables occurred for the total group where a statistical significant relationship at the .01 level was noted between reading (comprehension) ability and scores on the SPPT.

Thus, null hypothesis (b) can only be rejected in part.

- c) Scores on the test of Spatial Prepositions Paraphrasing correlated with intelligence quotients (total and language) at the .01 level of significance for grades two, three and four and for the



total group. The correlation between spatial prepositions paraphrasing and non language intelligence quotients was significant at the .05 level for grades two and four and at the .01 for the total group.

The null hypothesis statement (c) is, therefore, rejected.

An analysis of the data on the above hypothesis indicated that intelligence scores appear to be the best predictor of performance on the reading understanding test of spatial prepositions. A discussion of the relationship between intelligence and the listening understanding of prepositions (Chapter Two) had indicated the presence of such a relationship. However, no studies had been found which attempted to relate intelligence to the reading understanding of spatial prepositions. Thus the findings of this study would indicate that intelligence is an important factor in the reading understanding as well as in the listening understanding of these prepositions.

Reading ability (vocabulary and comprehension) appeared to be significant in predicting performance on the test of reading understanding of spatial prepositions at the grade two level only. The absence of such a relationship at the grade three and four levels may be explained by the fact that whereas the reading ability tests (Gates-MacGinitie Primary C and Survey D) were challenging for these pupils the Spatial Prepositions Paraphrase Test (reading understanding)





was fairly easy and scores tended to cluster very closely around the mean.

#### Null Hypothesis 5

In an analysis of the scores of the test of listening understanding of spatial prepositions

- a) there is no interaction between grade and sex
- b) there is no main effect due to sex
- a) From the analysis it was evident that no interaction took place between grade and sex. Grade appears to be the important factor in determining the responses on the test of Listening Understanding of Spatial Prepositions.
- b) Sex did not show a main effect on the performance on this test.

The null hypothesis statements (a) and (b) therefore, cannot be rejected.

#### Null Hypothesis 6

In an analysis of the scores on the test of reading understanding of spatial prepositions

- a) there is no interaction between grade and sex
- b) there is no main effect due to sex
- a) A significant interaction between grade and sex was noted in the analysis of the scores on the paraphrasing test. This interaction was the result of the boys' scores being higher than those of the girls at the grade two level while at the



other two grade levels, the girls scored higher than the boys.

The null hypothesis statement (a) is, therefore, rejected.

- b) The sex of the students did not affect the performance on the test of reading understanding of spatial prepositions although there was a main effect due to grade.

The null hypothesis statement (b) is accepted.

The data on the above two hypotheses would seem to indicate that sex does not appear to be a factor in determining the performance on the tests of listening and reading understanding of spatial prepositions. This finding is different from that of McLeod (1969), who found that sex did influence children's scores on all modes of response used in her prepositions test. She found that kindergarten boys scored significantly lower than did the kindergarten girls. However, the findings of Johnson (1970), whose sample also included grade two pupils, supports that of this study, since she found that ability to understand spatial prepositions does not appear to be influenced by sex differences because boys and girls performed about equally well on all portions of her Spatial Prepositions Test.

#### Descriptive Analysis of the Spatial Prepositions Sentence Completion Test and Spatial Prepositions Story Completion Test

The two tests of reading understanding mentioned in the above heading were analysed, descriptively. A summary



of the findings according to the various criteria used for analysis is given below. The results of the Sentence Completion Test are discussed under the first seven headings, whilst the Story Completion Test is dealt with under the final criterion.

#### The Five Most Difficult Spatial Prepositions on the Test of Spatial Prepositions Paraphrasing and Their Use on SPSC

The five most difficult prepositions (as determined by the paraphrase test) were around, above, in front of, behind, and on the right. These were found to be even more difficult when the pupils were required to complete sentences using these prepositions. It would appear that the task of using these prepositions is more difficult when the reading situation is less structured than it was, for example, on the paraphrase test.

#### The Six Easiest Spatial Prepositions on the Test of Spatial Prepositions Paraphrasing and Their Use on SPSC

The six easiest prepositions (as determined by the paraphrase test) were on top of, beneath, through, over, inside and underneath. These were also found to be more difficult when the pupils were required to complete sentences using these prepositions. With regards to the most difficult and the easiest prepositions the grade three and four children generally did better on the sentence completion test than did the grade two children.

#### The Number of Different Responses Per Preposition

Grade two students tended to give more responses than





pupils in the other two grades to the various prepositions although the grade four pupils usually gave a greater number of acceptable responses. This suggests that the grade four students had greater linguistic control of the meaning of these prepositions.

#### The Nature of the Words Substituted Per Preposition

Prepositional synonyms were given for above, beside, inside, outside, and, on the right. The grade two children gave synonyms for all of these prepositions.

Synonyms provided in lieu of the above prepositions were over, by, in and into, out, and, at the right.

Antonyms for on the right, supplied by a few children in all grades, suggests that confusion concerning the concepts of left and right still exists particularly where a child must orient himself in terms of another person or object.

Other words and prepositions were substituted in place of prepositions by children at all grade levels. In some instances these words were acceptable in terms of sentence completion. Some children substituted prepositions or other words that were spatial in meaning but which did not always suit the context for which they were intended. It appears that there may be stages of refinement in the acquisition of the concepts underlying these prepositions. The verbal label (required to complete the sentences of the Sentence Completion Test) may be the last of these stages to be acquired.



### Consistency of Responses of Specific Prepositional Synonyms

Certain prepositions such as beneath, underneath, outside, and inside did not feature in the responses given on the sentence completion test. This suggests that these prepositions are not in colloquial use to the extent that they were in the past. Because children do not hear adults using them they fail to become familiar with their meanings.

### Static Location or Movement and Destination

Understanding of vertical and horizontal relations demonstrated through above, below, on the right, and on the left was greatest at the grade four level. Position and dimensionality (between) and proximity (beside) were difficult for all grades. Movement and destination (out) was found to be easy by all grades. This may have been so because of the verb governing the prepositions (in this instance the verb was go).

### Specific Semantic Context of the Spatial Prepositions

The semantic context in which a preposition is placed appears to influence the difficulty of the preposition. The objects between which the preposition indicates a relation tend to determine the specific choice of a preposition. Children in this study gave a variety of responses for most sentences. At times their responses indicated that their ideas as to what could be considered feasible differed from those of adults. For example, many children were of the opinion that it is feasible to make a dog sit on a bicycle.



### Contextual Congruity

The holding in mind of the different spatial concepts, which is necessary for acceptable completion of the sentences within a story to be accomplished, appears to be a difficult task for children in grades two, three and four. Many children were able to make closure for individual sentences within the story but failed to choose a preposition which was suitable in terms of story context. The grade four children showed greater success with this test than either of the grade two or three children.

### III. SUGGESTIONS FOR FURTHER RESEARCH

The findings of this study have revealed a number of areas where further research is needed.

1. Information concerning the ability of children in the primary and elementary grades to use spatial prepositions in their own writing would be of value since the ways in which these prepositions are used should give an indication as to the understanding which children may have of the particular uses of specific prepositions within different sentence structures. Research has already shown that children read with greater understanding when the language of print is similar to their own (Strickland, 1962) so it is possible that children's writing may give clues as to what sentence structures incorporating prepositions would be suitable for inclusion in text books, or written exercises.
2. Since the children who participated in this study





came from English speaking homes a further study involving children from different language backgrounds would be useful in helping to establish guidelines for the kinds of concepts which need to be developed as part of the language-arts program. Children from inner-city schools or from native reserves may well have less understanding of spatial concepts than do the children from middle class homes who participated in this study.

3. Investigation of other spatial terms such as bottom, top, middle, upper, lower and further would help to establish whether other spatial concepts are developmental and also whether they are a source of difficulty in reading.

4. It is possible that children with visual perceptual handicaps may have less well developed spatial concepts than children who are not so handicapped. A study of the understanding of spatial prepositions shown by children with visual perceptual difficulties might, therefore, be of value in establishing guidelines for the development of special exercises to remediate any difficulties found.

5. Since certain spatial concepts were found to be more difficult than others in this study, a series of lessons could be devised to aid in the development of spatial concepts. These lessons could incorporate parts of the physical education, drama and language arts curriculum so that complete understanding of spatial terms, both through physical orientation and through the introduction of the verbal labels to suit that orientation, could be promoted. Pre tests and



posttests on pupils' understanding of spatial prepositions might be used to evaluate the success of this program.

6. The sentence completion test used in this study was not organized in terms of specific types of sentence structure. A test which incorporated spatial prepositions within a variety of syntactical structures might provide more information as to what other factors contribute to difficulty in the reading of spatial prepositions.

7. The children who participated in this study were of average or higher reading and mental ability. If such children found the reading understanding of spatial prepositions difficult it would appear that poor readers and children with less than average intelligence would be likely to find spatial prepositions even more difficult to comprehend. A study, therefore, involving children of this nature might reveal further sources of difficulty with spatial concepts in print. This would no doubt be a difficult task to accomplish because of word recognition difficulties, however, carefully controlled vocabulary items could be devised for this purpose.

8. Further research on the difficulty of certain prepositions in story form as opposed to the difficulty of the same prepositions presented in sentence form (apart from story content) would be beneficial.

#### IV. IMPLICATIONS OF THIS STUDY

The fact that difficulty in understanding a number of



spatial prepositions, both through listening and reading was noted at the grade two, three and four levels in this study suggests that teachers must be prepared to help clarify certain spatial concepts for their pupils if greater understanding is to ensue. Whilst it is of little value to present concepts to children before they are mature enough to understand them it is nevertheless helpful to prepare children for the concepts which they are likely to meet in print. Since most of the prepositions in the listening understanding test were understood in this study it would appear that children in grades two, three and four do have an awareness of spatial concepts although they do not have as much understanding of the printed symbols which represent these concepts.

It might, therefore, be advisable to work with these concepts in a concrete manner at first.

1. The concepts of in front of and behind for example could be developed as part of a gym lesson. Using objects such as a hoop or a rope the children could stand in front of and then behind either of these objects. In order to develop the verbal labels for these concepts the children should be encouraged to speak about their own positions, for example, Now I am standing in front of the hoop. Now I am sitting behind it. No attempt should be made to have the children state what another person's position is in relation to the hoop etc. until they have completely mastered the concept in terms of personal orientation. Since the object of the lesson would be to make a transfer into the





reading situation a follow-up lesson in the classroom could follow. The teacher could for example prepare a series of large cards on which the preposition presented in the gym class was printed. The children could then write a sentence using that preposition and could illustrate it. Reading the sentence aloud to a friend would help to establish the visual and verbal label for each concept.

2. Right and left are concepts which cause many adults to falter which suggests that these concepts need constant reinforcing especially in young children. The difficulty becomes compounded when right and left must be demonstrated from another person's point of view. To help children develop this kind of understanding the use of glove puppets could be employed. Working in pairs each child could require his partner's puppet to obey his commands, for example: Touch my right ear, or Hold my left hand.

3. Drawing activities involving written directions could also be used to develop horizontal and vertical relations. For Example:

Draw a clown. Make his left sleeve long. Make his right sleeve short.

Draw an umbrella above his head. Put a table below his feet, etc.

In this way the activity is semi concrete in its spatial representation and it includes the written verbal labels required.

4. Although the historical import of nursery rhymes (at



least those of the non-political variety) is lost in antiquity it seems reasonable to suggest that they were the means of teaching many important concepts particularly those concerning time and space. It might, therefore, be helpful to revive the art of reciting these rhymes to aid in the development of spatial concepts. Dramatization of the rhymes would make them more palatable to the older primary grade children. Emphasis should be placed on the words representing the concepts to be learned. The copying of rhymes and illustrating them for use in kindergarten or grade one classrooms, particularly on enormous sheets of paper, or in giant-size booklets, would appeal to children in the lower elementary grades. Underlining the spatial concepts would help to reinforce the idea in the mind of the writer and later in the mind of the reader.

5. Since it was shown in this study that the choice of a spatial preposition depends on the particular semantic context in which it is used, children may be given practice in selecting prepositions to suit various sentence contexts for example, The spider crawled — the papers. The objects between which the prepositions indicate a relationship and the intervening verb may be interchanged (e.g. spider changed to boy and crawled changed to sat) and the pupils may be asked to suggest other suitable prepositions and through discussion be led to see how the sentence context affected the choice of the preposition.



## V. CONCLUDING STATEMENT

This study has revealed that children's listening understanding of spatial prepositions is superior to that of their reading understanding of those same prepositions. Although some reading understanding of spatial prepositions was shown by the grade two children, greater understanding was apparent at the grade three and four levels.

The findings of this study also indicate that spatial prepositions presented within the context of a story are more difficult than when they are presented in unrelated sentences.

In view of these findings, provision should be made to prepare children for the spatial prepositions that they will meet in print so that greater understanding of the relationships within a sentence (which prepositions denote) might ensue.





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APPENDIX A

THE TESTS OF SPATIAL PREPOSITIONS  
LISTENING AND READING  
UNDERSTANDING





THE SPATIAL PREPOSITIONS LISTENING  
UNDERSTANDING TEST (SPLUT)



1. The service station man came out of the service station.
2. A green truck drove inside the yellow garage.
3. A big truck parked on the left of the green truck.
4. Tom went and stood near the big truck.
5. Then a red car stopped beside the gas pumps.
6. Tom went across the field to the ferris wheel.
7. A girl in a red dress was standing on top of the zoo fence.
8. A dog stood beneath the ferris wheel.
9. An aeroplane flew over the service station.
10. The dog ran around the ferris wheel.
11. The girl went and stood behind the ferris wheel man.
12. A tow truck stopped in front of the red car.
13. There was another dog on the roof of the service station.
14. That dog went and stood between the red car and the truck.
15. The yellow ferris wheel chair is above the red chair.
16. The girl is now standing on the right of the ferris wheel man.
17. An elephant put his head through the zoo fence.
18. A crocodile crawled underneath the fence.
19. The tiger put his head below the bottom rail of the same fence.
20. A green car is outside the zoo fence.



THE SPATIAL PREPOSITIONS PARAPHRASING  
TEST (SPPT)





1. The spinning top spun around on the floor.
  - A. The spinning top moved up and down the floor.
  - B. The spinning top moved on top of the floor.
  - C. The spinning top moved in a circle on the floor.
  - D. The spinning top moved sideways on the floor.
  
2. The bottom shelf is below the top shelf.
  - A. The top shelf is above the bottom shelf.
  - B. The bottom shelf is higher than the top shelf.
  - C. The shelf at the bottom is above the top shelf.
  - D. The bottom shelf is above the top shelf.
  
3. The man pulled a rabbit out of his hat.
  - A. The rabbit was hiding in the man's hat.
  - B. The man had a rabbit underneath his hat.
  - C. The rabbit was taken from the man's hat.
  - D. The man placed a rabbit inside his hat.
  
4. My little toe is on the right of my right foot.
  - A. My right foot has a little toe on the left.
  - B. My little toe is on the right of my left foot.
  - C. My little foot is on the right of my right toe.
  - D. My right foot has a little toe on the right.



5. Dick put his books on the table.
- A. The table was under Dick's books.
  - B. Dick put his books beneath the table.
  - C. The books were placed beside the table.
  - D. Dick put a table on his books.
6. Betty jumped over the mud puddle.
- A. Betty jumped around the mud puddle.
  - B. Betty jumped through the mud puddle.
  - C. Betty jumped across the mud puddle.
  - D. Betty jumped away from the mud puddle.
7. The snow was on top of the car.
- A. The car was covered with snow.
  - B. The snow was underneath the car.
  - C. The car was on top of the snow.
  - D. The snow was beneath the car.
8. A little mouse sat beneath the table.
- A. A little mouse sat inside the table.
  - B. A little mouse sat beside the table.
  - C. A little mouse sat under the table.
  - D. A little mouse sat across the table.



9. The boy played near the road.
- A. The road was a playground for the boy.
  - B. The boy played on the road.
  - C. The road was close to the boy.
  - D. The boy was playing in the road.
10. The train went through the tunnel.
- A. The train went into one end of the tunnel and came out of the other end.
  - B. The train went into the tunnel and stayed inside in the dark.
  - C. The train came out of the tunnel and went back in again.
  - D. The train went around the tunnel.
11. The children hid underneath the bed.
- A. The bed was in front of the children.
  - B. The bed was over the children.
  - C. The children were beside the bed.
  - D. The children were near the bed.
12. The mouse came outside his cage.
- A. The mouse was trying to get into his cage.
  - B. The mouse was trying to get around his cage.
  - C. The mouse left the inside of his cage.
  - D. The mouse was standing in the cage doorway.





13. Mary was sitting in front of Jane.
- A. Jane was sitting beside Mary.
  - B. Mary was sitting on the right of Jane.
  - C. Jane was sitting behind Mary.
  - D. Jane was sitting with her back to Mary.
14. All the men were on the left of the crowd.
- A. The women and children were on both sides of the men.
  - B. The rest of the crowd were in front of the men.
  - C. The women and children were on the right of the men.
  - D. The men were in between the women and children.
15. Inside the box was a silver dollar.
- A. The box held a silver dollar.
  - B. A silver dollar was under the box.
  - C. A silver dollar was outside the box.
  - D. Beneath the box was a silver dollar.
16. The plane flew above the clouds.
- A. The clouds were between the plane and the ground.
  - B. The plane was between the clouds and the ground.
  - C. The clouds were higher than the plane.
  - D. The plane was in the clouds.



17. The fisherman sat beside the river.
- A. The fisherman sat on the bank of the river.
  - B. The fisherman sat in a boat on the river.
  - C. The fisherman sat in a tree across the river.
  - D. The fisherman sat in the river.
18. The boy hid behind the open door of the classroom.
- A. The boy hid near the classroom door.
  - B. The boy hid beside the classroom door.
  - C. The classroom door was in front of the boy.
  - D. The classroom door was behind the boy.
19. A big blackbird flew across the treetops.
- A. A big blackbird flew among the treetops.
  - B. A big blackbird flew towards the treetops.
  - C. A big blackbird flew over the treetops.
  - D. A big black bird flew around the treetops.
20. The dog was sitting between the door and the table.
- A. The table was in the middle of the dog and the door.
  - B. The table and the dog were on each side of the door.
  - C. The dog was in front of the door and the table was behind the door.
  - D. The dog had a table on one side and a door on the other.



THE SPATIAL PREPOSITIONS SENTENCE  
COMPLETION TEST (SPSCT)





1. Ann looked \_\_\_\_ her shoulder at Mary.
2. Do not throw your pencil \_\_\_\_ of the window.
3. David got his leg stuck \_\_\_\_ the desk and the chair.
4. The sun shone high \_\_\_\_ the clouds.
5. Billy made his dog sit \_\_\_\_ his bike.
6. The goldfish swam \_\_\_\_ in his bowl.
7. I found a frog hiding \_\_\_\_ a stone.
8. Wipe your feet before you come \_\_\_\_ the house.
9. Father held a surprise parcel \_\_\_\_ his back.
10. Ladies put lipstick \_\_\_\_ their lips.
11. The children swam \_\_\_\_ the pool from one side to the other.
12. The little boy had to stand \_\_\_\_ \_\_\_\_ \_\_\_\_ the table to reach his coat.
13. Do not go too \_\_\_\_ a wild animal.
14. Dick pushed \_\_\_\_ \_\_\_\_ \_\_\_\_ Ted in the line-up.
15. Sally's ball went \_\_\_\_ the window and broke it.
16. Don't go \_\_\_\_ in a hail storm.
17. A spider crept \_\_\_\_ the pile of papers.
18. The number 9 is \_\_\_\_ \_\_\_\_ \_\_\_\_ of a clock.
19. The airplane pilot looked down at the people \_\_\_\_.
20. Jim held mother's right hand so he had to walk \_\_\_\_ \_\_\_\_ \_\_\_\_ of her.



THE SPATIAL PREPOSITIONS STORY  
COMPLETION TEST (SPStCT)



Clancy was a funny pig. He wanted to see everything that went on at the farm. One morning Clancy walked \_\_\_\_\_ of the pen. He saw the duck swimming \_\_\_\_\_ the pond. The rooster sat \_\_\_\_\_ the tree.

Clancy saw the farmer go \_\_\_\_\_ the barn. He was gone for a long time. Then he came around on the \_\_\_\_\_ side of the barn with a large box.

"What can that be?" said Clancy. The farmer put the box down \_\_\_\_\_ the tree. Then he walked away.

Clancy had to go and look. He walked \_\_\_\_\_ to the box. He sat \_\_\_\_\_ the box. Nothing happened! He looked \_\_\_\_\_ the boards in the box but could see nothing.

"What can be in the box?" said Clancy. He could see the hayloft \_\_\_\_\_ the barn door. "Maybe there is something up there I can use to open the box," said Clancy. He walked \_\_\_\_\_ the barn door and went in. He climbed the ladder up to the hayloft.

Then the farmer came and took the ladder away. How would he get down? He could see the pond, the trees, the cows \_\_\_\_\_ him. It looked so far down. He saw the bridge \_\_\_\_\_ the pond.

He saw Mr. Rooster sitting \_\_\_\_\_ the fence and called to him.

"Please help me get down!" called Clancy.

Mr. Rooster looked around the farm and saw a rope \_\_\_\_\_ the shed, \_\_\_\_\_ the tractor. He picked the rope up with his beak and flew to the hayloft.

Several animals were standing \_\_\_\_\_ the barn watching and told Clancy to throw one end of the rope down.

They tied it onto the haystack and pulled the rope down. "Get on the haystack and we'll lower you down," called the rooster.

As Clancy came down, the animals cheered. Then Clancy saw the farmer open the box. \_\_\_\_\_ was a baby chick. Now Clancy was happy. He could see what was in the box.

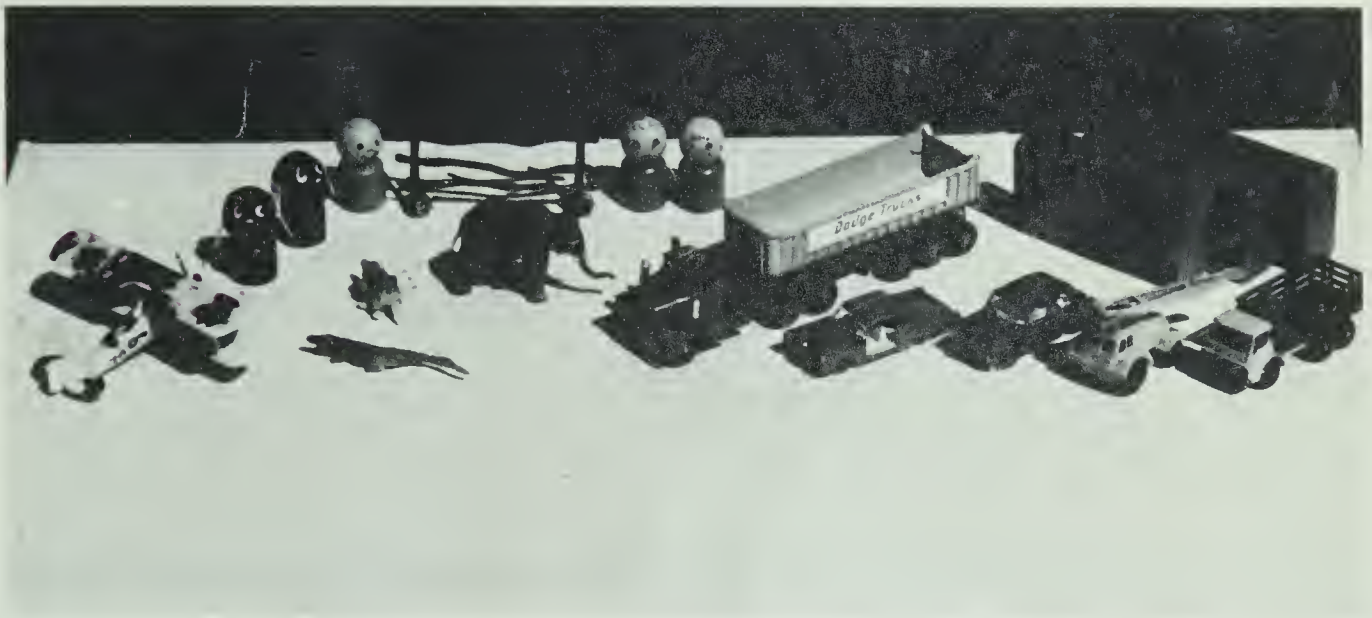




APPENDIX B

TOYS USED IN CONJUNCTION WITH THE  
SPATIAL PREPOSITIONS LISTENING  
UNDERSTANDING TEST







APPENDIX C

RAW SCORES OF SUBJECTS ON THE  
TESTS OF SPATIAL PREPOSITIONS  
LISTENING AND READING  
UNDERSTANDING





TABLE 17

RAW SCORES ON THE TEST OF SPATIAL PREPOSITIONS  
LISTENING UNDERSTANDING

Grade II	RAW SCORES	GRADE III	RAW SCORES	GRADE IV	RAW SCORES
01	20	21	19	41	20
02	20	22	20	42	20
03	18	23	20	43	20
04	18	24	18	44	20
05	20	25	20	45	20
06	18	26	19	46	20
07	17	27	20	47	20
08	19	28	20	48	20
09	19	29	19	49	20
10	19	30	20	50	20
11	18	31	20	51	18
12	19	32	20	52	20
13	19	33	20	53	20
14	18	34	18	54	20
15	20	35	19	55	17
16	18	36	20	56	20
17	19	37	20	57	20
18	18	38	18	58	20
19	20	39	20	59	20
20	20	40	20	60	20



TABLE 18

RAW SCORES ON THE TEST OF SPATIAL PREPOSITIONS  
PARAPHRASING

GRADE II SUBJECTS	RAW SCORES	GRADE III SUBJECTS	RAW SCORES	GRADE IV SUBJECTS	RAW SCORES
01	17	21	17	41	19
02	18	22	11	42	18
03	15	23	18	43	16
04	13	24	17	44	19
05	16	25	14	45	16
06	17	26	12	46	17
07	16	27	17	47	17
08	13	28	16	48	18
09	17	29	20	49	16
10	17	30	12	50	14
11	08	31	20	51	20
12	15	32	15	52	18
13	09	33	19	53	19
14	16	34	20	54	20
15	11	35	16	55	16
16	18	36	18	56	19
17	19	37	18	57	19
18	13	38	18	58	19
19	12	39	17	59	16
20	16	40	20	60	18











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